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SAINT CROIX FLEET MOORING PROJECT EXECUTION PLAN

APRIL 1985

OCEAN ENGINEERING
AND CONSTRUCTION PROJECT OFFICE
CHESAPEAKE DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
WASHINGTON, DC 20374

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The Navy uses the pier at Frederiksted, St. Croix, USVI for berthing naval vessels in order to attach equipment in conjunction with the use of the Under water Tracking Range (UTR). The pier was badly damaged by Hurricane Klaus in November 1984. Commander, Submarine Force Atlantic (COMSUBLANT) has (Con't)

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tasked the Chesapeake Division, Naval Facilities Engineering Command (CHESNAV FACENGCOM) to install a mooring in the Frederiksted area to be used in place of the pier while the pier is being repaired. The Ocean Construction Platform (OCP) SEACON will be the installation vessel.

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SAINT CROIX FLEET MOORING
PROJECT EXECUTION PLAN

1.0 GENERAL

1.1 Background. The Navy uses the pier at Frederiksted, St. Croix, USVI for berthing naval vessels in order to attach equipment in conjunction with the use of the Underwater Tracking Range (UTR). The pier was badly damaged by Hurricane Klaus in November 1984. Commander, Submarine Force Atlantic (COMSUBLANT) has tasked the Chesapeake Division, Naval Facilities Engineering Command (CHESNAVFACENGCOM) to install a mooring in the Frederiksted area to be used in place of the pier while the pier is being repaired. The Ocean Construction Platform (OCP) SEACON will be the installation vessel.)

1.2 Organizational Responsibilities. The major activities involved in this project are:

CHESNAVFACENGCOM

Underwater Construction Team One (UCT ONE)

St. Croix Underwater Tracking Range (UTR)

Naval Station (NAVSTA) Roosevelt Roads

TRACOR Marine (Contractor)

1.2.1 CHESNAVFACENGCOM Responsibilities

- a. Prepare a project execution plan.
- b. Coordinate the project execution with all other commands.
- c. Provide on site technical supervision and field engineering support.

- d. Procure all mooring hardware required for the project.
- e. Provide all equipment for the project except for the dive system equipment.
- f. Provide SEACON and crew.
- g. Provide project logistics including messing and berthing for all onsite personnel.
- h. Promulgate a Notice to Mariners.
- i. Provide radios for project communications.
- j. Document project operations and prepare as built drawings.

1.2.2 UCT ONE Responsibilities

- a. Provide personnel to perform construction tasks, including diving, deck, and surveying operations.
- b. Provide and operate surveying equipment.
- c. Provide diving gear and diving platform.
- d. Provide or arrange for all diving safety including a decompression chamber.

1.2.3 St. Croix UTR Responsibilities

- a. Provide on-site logistic support.
- b. Provide theodolites as backup to CHESNAVFACENGCOM theodolites.
- c. Provide radios for communications between SEACON and the UTR.

1.2.4 NAVSTA Roosevelt Roads Responsibilities

- a. Provide 80 tires for riser fendering system.

- b. Provide crane services required for project mobilization.
- c. Provide a YC barge and an LCM-8 boat and crew for diver support.
- d. Provide a YTB to tow the YC barge to St. Croix and return.

1.2.5 TRACOR Marine (Contractor) Responsibilities

- a. Provide a crew for the OCP SEACON.
- b. Provide four PVC marker buoys (3 inches by 20 feet).
- c. Receive material shipped to Port Everglades.
- d. Provide crane operators.

1.3 Safety. This project shall be conducted in such a manner that established safety standards, practices, and regulations are followed. It shall be the responsibility of each individual assigned to the project to practice safety during all assigned tasks and to report promptly to the cognizant authority any unsafe conditions or practices noted.

1.3.1 Safety Responsibilities. Each activity assigned to this project is responsible for the safety of its personnel. In addition, specific activities are responsible for general areas of safety as follows:

COGNIZANT ACTIVITY

RESPONSIBILITY

CHESNAVFACENGCOM

Responsible for the safe operation of SEACON, its crew, equipment and all personnel working on-board. Assure proper ordnance handling procedures in accordance with the Propellant Embedment Anchor (PEA) Manual.

UCT ONE

All diving operations and diving safety, including the decision to dive or not, depending on weather or site conditions.

1.3.2. Personal Safety Equipment. All regulations concerning the use of personal safety equipment shall be followed. Work vests, safety shoes, and hardhats shall be worn by all personnel on the afterdeck during deck operations.

1.4 Project Site. St. Croix is located in the U.S. Virgin Islands approximately 50 miles southeast of Puerto Rico (see Figure 1-1). The mooring is to be installed near the pier at Frederiksted (see Figure 1-2).

1.4.1 Environmental Conditions. A 50-knot wind with a 30-second duration was selected for the design calculations. The water depth in the proposed mooring installation area varies between approximately 40 and 120 feet. Tidal ranges are from 0.8 to 1.8 feet. Currents vary but can reach 2 knots.

1.5 Mooring Description. The mooring (see Figure 1-3) is designed as a three-legged mooring using Propellant Embedment Anchors (PEAs) instead of the standard drag anchors. Each leg consists of 2 1/4-inch chain attached to the ground ring at the center of the mooring and the downhaul cable at the anchor end. Each leg contains a swivel and three in-line zinc anodes. Leg numbers 2 and 3, located in the deeper water, have three shots of chain in each of their ground leg subassemblies while leg number 1, located in more shallow water, consists of four shots of chains.

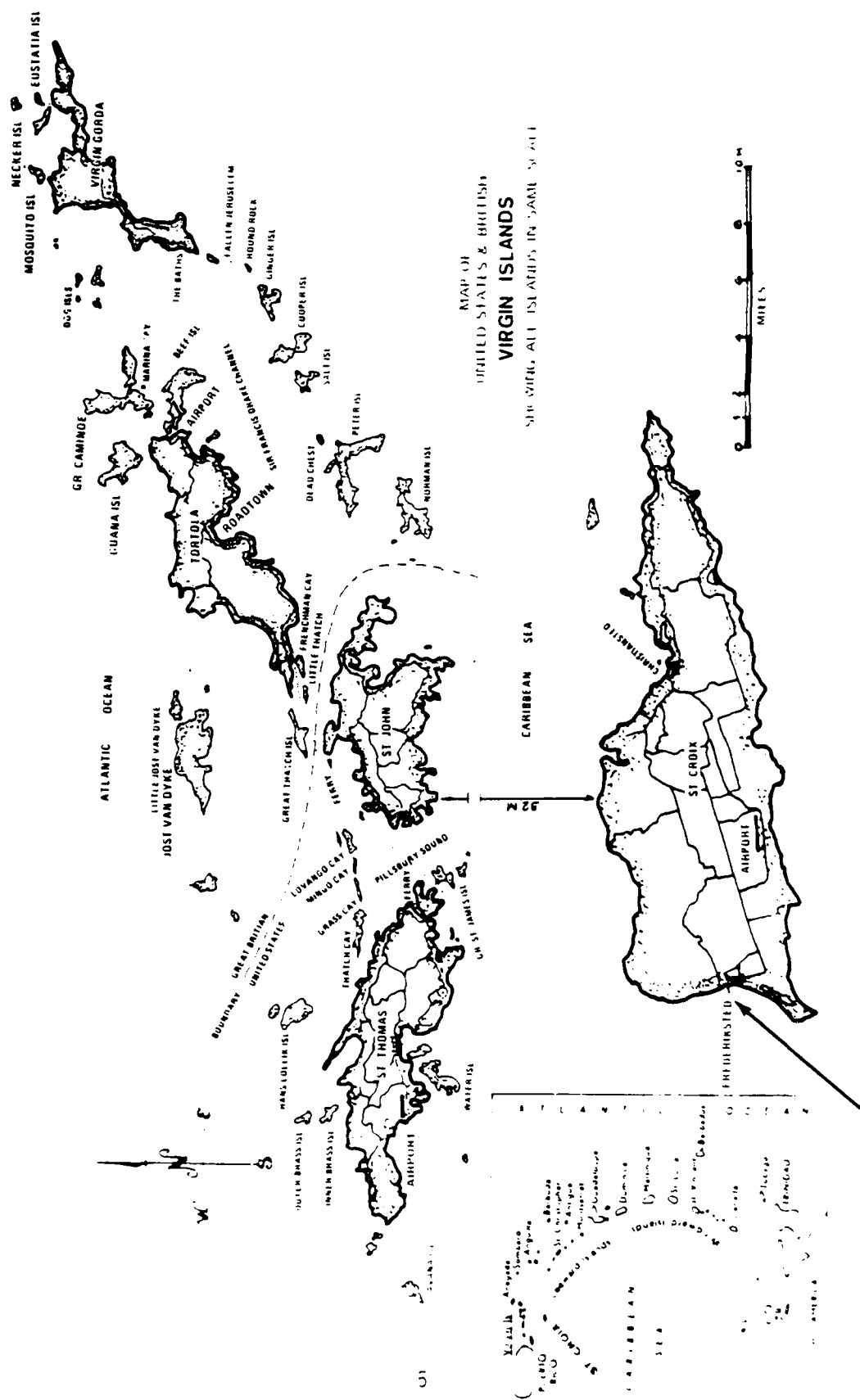


FIGURE 1-1. Geographical Location of Saint Croix

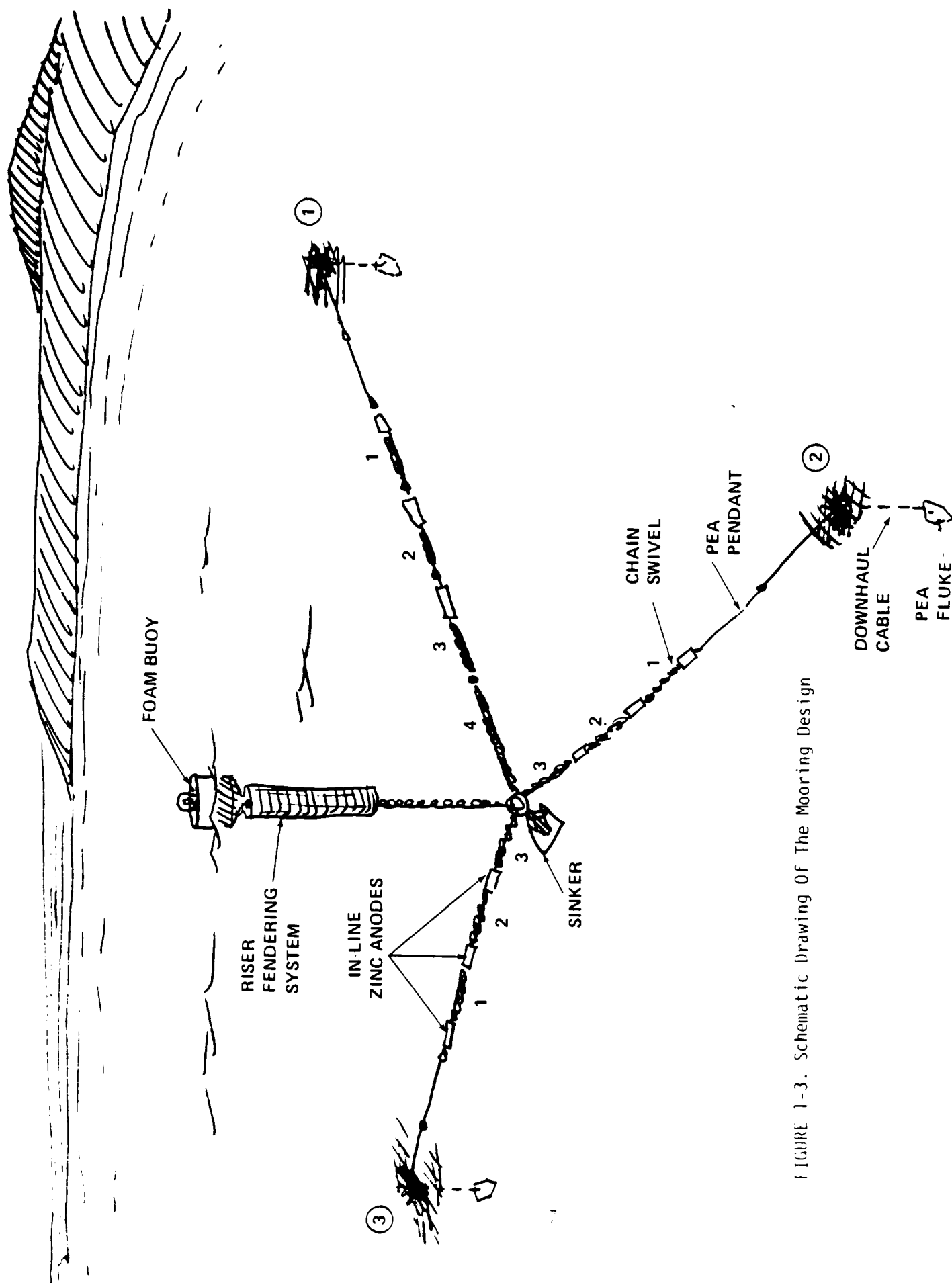


FIGURE 1-3. Schematic Drawing Of The Mooring Design

The downhaul cable from the anchor consists of a 50-foot 2 1/4-inch wire rope. A 120-foot 2 1/4-inch wire rope pendant is attached to the downhaul cable. The riser is 115 feet of 2 1/4-inch chain with a swivel and contains an in-line anode. Also attached to the ground ring is a 16,000 pound stockless anchor that acts as a sinker.

Because the mooring is designed to take both surface ships (CGN-38 VIRGINIA Class) and submarines (SSBN-616 LAFAYETTE Class), a special buoy has been procured. The buoy is structural foam coated with a tough, polyurethane elastomer to protect submarines from rubbing damage. In addition, automobile tires will surround the upper 40 feet of the riser to act as a riser fendering system and to protect the submarine from damage by the riser chain.

1.6 Design Criteria. The locations of the anchors and the final location of the buoy have been determined to specifications outlined in the original tasking. The only critical factor is the shoreward extent of the watch circle. This is determined by the draft of the vessels and possible storm surge.

For the installation procedures that follow, a 20-foot tolerance is acceptable for the location of the anchors beyond the exact locations found in Table 1-1. Figure 1-4 depicts the positions of the three anchors and mooring center.

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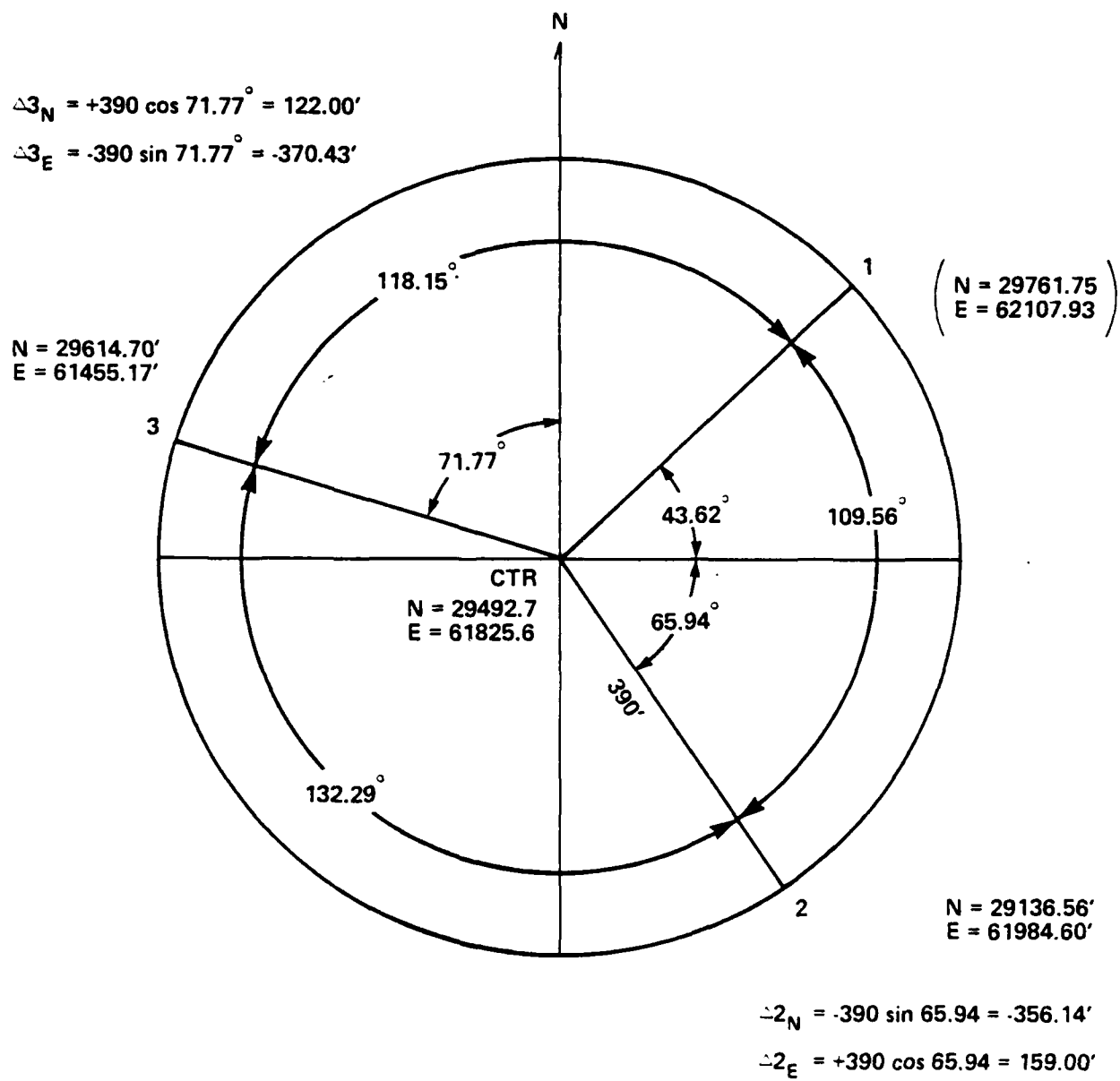


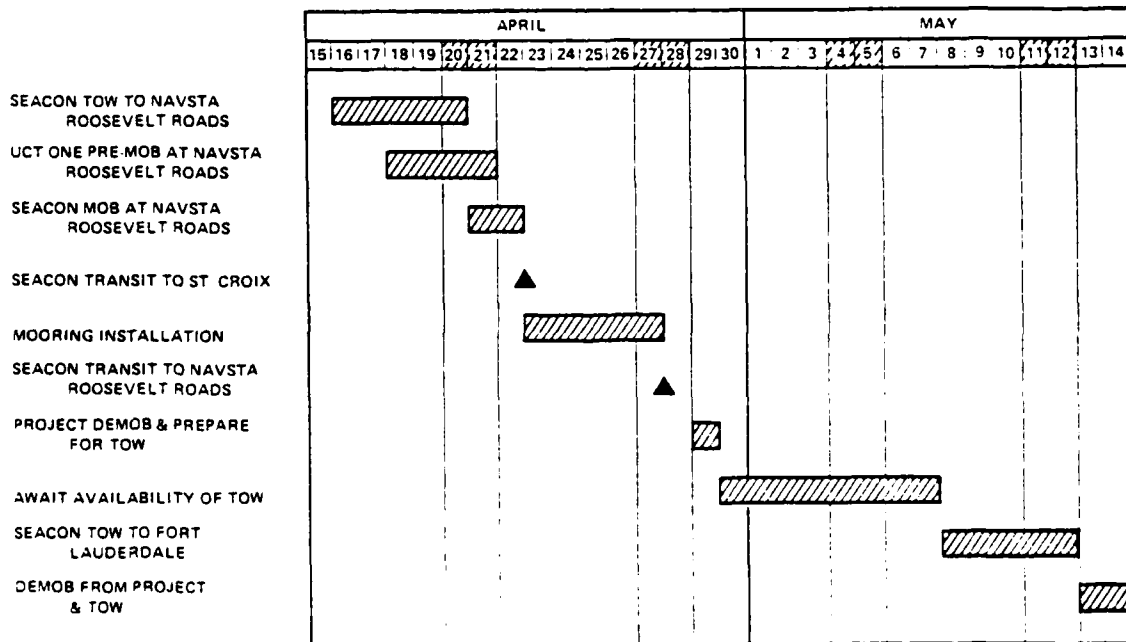
FIGURE 1-4. Mooring Center and Anchor Coordinates

2.0 PROJECT SCHEDULE

2.1 Schedule of Events. The following is the proposed schedule of events.

16-20 April	SEACON towed to NAVSTA Roosevelt Roads by USNS POWHATAN T-ATF 166
18-21 April	UCT ONE pre-mobilization phase work onshore
21-22 April	Mobilize for mooring at Roosevelt Roads. Transit to St. Croix the night of 22 April.
23-27 April	Mooring installation. Return to Roosevelt Roads night of 27 April.
28 April	Demobilize from the project at Roosevelt Roads. Prepare for tow.
29 April-7 May	Await availability of tow.

ST. CROIX MOORINGS - PROJECT SCHEDULE



8-12 May

Tow from NAVSTA Roosevelt Roads to Fort
Lauderdale by USNS POWHATAN.

13-14 May

Demobilize from the project and tow at Fort
Lauderdale.

3.0 MOBILIZATION

3.1 Pre-installation Inventory Inspection. This inspection was conducted by CHESNAVFACENGCOM personnel and consisted of:

- o Verifying that the material delivered complies with the design materials list (see Table 3-1).

- o Assuring that all components fit together and are in a ready to use condition.

3.2 Roosevelt Roads Mobilization Phase.

3.2.1. Onshore Work. The following will be accomplished ashore:

- o Attach the 5/16-inch wire rope continuity cable to the riser chain. Be sure that the wire is slack enough to allow for the designed catenary. Allow approximately 5 feet extra on each end.

- o Attach the wire rope with hose clamps every 8 links.

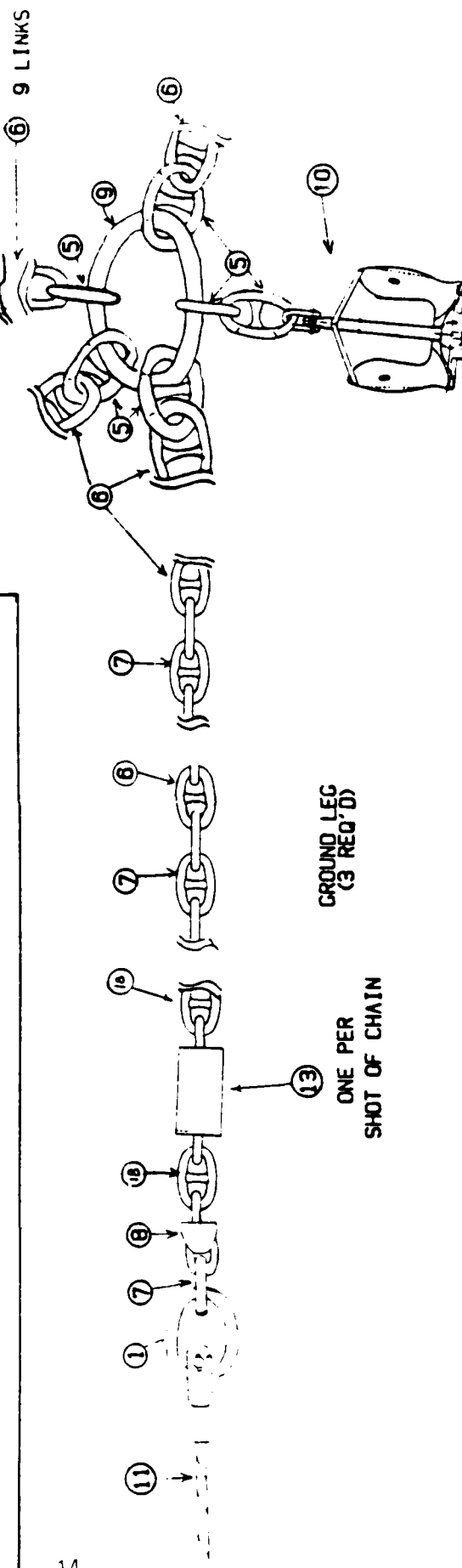
- o Prepare the riser fender system by bolting tires together in groups of six (see Figure 3-1).

- o Attach the riser fender system and the riser to the buoy.

BILL OF MATERIALS

TABLE 3-1. Bill of Materials

ITEM NO	FEDERAL SPEC OR PART NO.	DESCRIPTION	NO. REQUIRED	MATERIAL
1	4010 274 5022	2 INCH PEAR LINK	4	STEEL
2	MB 20	BUOY WITH 3 1/2 INCH SHACKLES FURNISHED TOP AND BOTTOM (SEA- WARD "MB-20") OR EQUAL	1	ELASTOMER HULL, STEEL BAR & SHACKLE
3	SUS1 R 006	1 1/2 INCH ROPE (SEE NOTE 3)	12 LP	POLYPROPYLENE (UV PROTECTED)
4	4010-391-0535	2 1/2 INCH ANCHOR JOINING LINK	1	STEEL
5	4010-391-0534	2 1/4 INCH ANCHOR JOINING LINKS	7	STEEL
6	4010-340-1030	2 1/4 INCH CHAIN SHOTS	10	STEEL
7	4010-391-0542	2 1/4 INCH DETACHABLE LINKS	14	STEEL
8	4010-527-8864	2 1/4 INCH SWIVEL	4	STEEL
9	2040-234-6888	2 1/4 INCH GROUND RING	1	STEEL
10	H2040-368-4772	16K NAVY STOCKLESS ANCHOR	1	STEEL
11	3017741 & 42	PROPELLMENT EMBEDMENT ANCHOR KITS (100 KIP SIZE)	3	STEEL
12	----	TIRES	AS REQUIRED	RUBBER
13	FPO 1 8022	CHAIN CATHODIC PROTECTION ASSEMBLY	10	ZINC
14	UNC 5/8" 11	GALVANIZED BOLTS (L=2.25" THREADED ENTIRE LENGTH)	AS REQUIRED	GALVANIZED STEEL
15	UNC 5/8"	GALVANIZED WASHERS-TYPE B (WIDE)	AS REQUIRED	GALVANIZED STEEL
16	UNC 5/8"	GALVANIZED LOCK WASHERS	AS REQUIRED	GALVANIZED STEEL
17	UNC 5/8" 11	GALVANIZED HEX NUTS	AS REQUIRED	GALVANIZED STEEL
18	4010 391-0543	2 1/2 INCH DETACHABLE LINKS	20	STEEL



- o Weld flukes shut on the 16,000 pound anchor. Weld bars between the flukes and the shank to prevent chain from being fouled in the flukes.

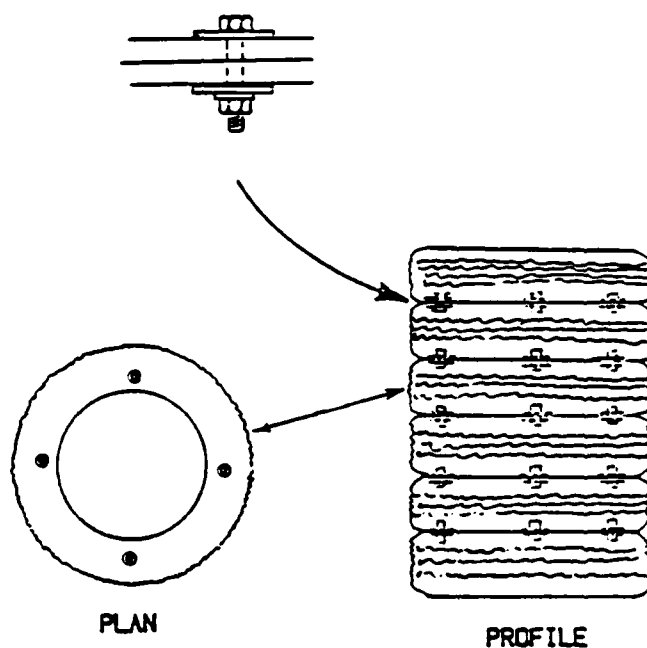


Figure 3-1. Bolting Tires Together

- o Load equipment and material that is at NAVSTA Roosevelt Roads on board SEACON as shown in Figure 3-2.

3.2.2. Onboard Work. The following will be accomplished aboard the SEACON:

- o Rig the purchase of the beach gear with 7/8-inch wire rope.



- o Install the 30 KIP in-line tensiometer on one lay of the purchase of the beach gear. The tensiometer's reading will be 1/9 of the actual load (100K pull will read 11.1K) (see Figures 3-3 and 3-4). A running line dynamometer (see Figure 3-5) will also be available.

- o Remove "headache ball" from Liebherr Crane.

- o Practice handling the PEA over the side to ensure familiarity with this operation (see Section 4.3).

3.2.3. Diving Support.

- o Stow all material and prepare the YC barge, supplied by Roosevelt Roads, for tow (see Figure 3-6).

- o The YC barge will be towed to St. Croix by the YTB provided by the Naval Station.

- o The LCM-8, supplied by Roosevelt Roads for onsite use as a pusher boat, will make the transit to St. Croix under its own power.

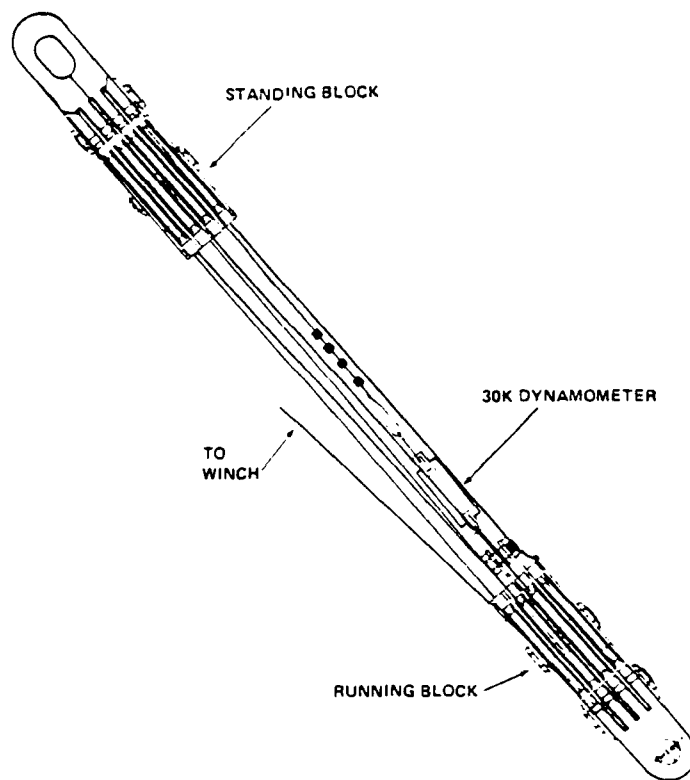
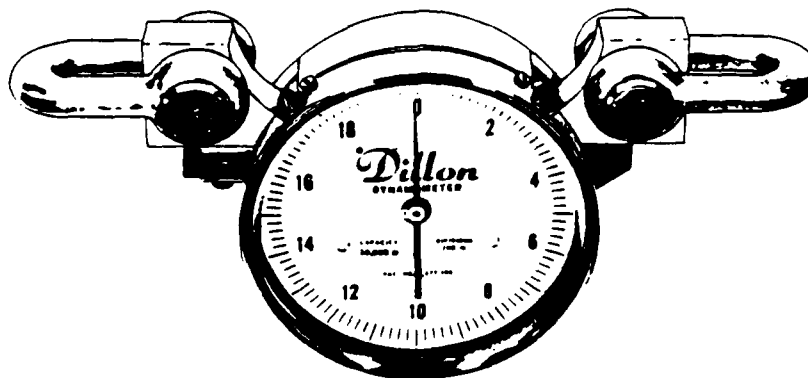


FIGURE 3-3. Tensiometer Installed In One Leg Of The Beach Gear



CAPACITY 30,000 LB

FIGURE 3-4. Typical Tensiometer

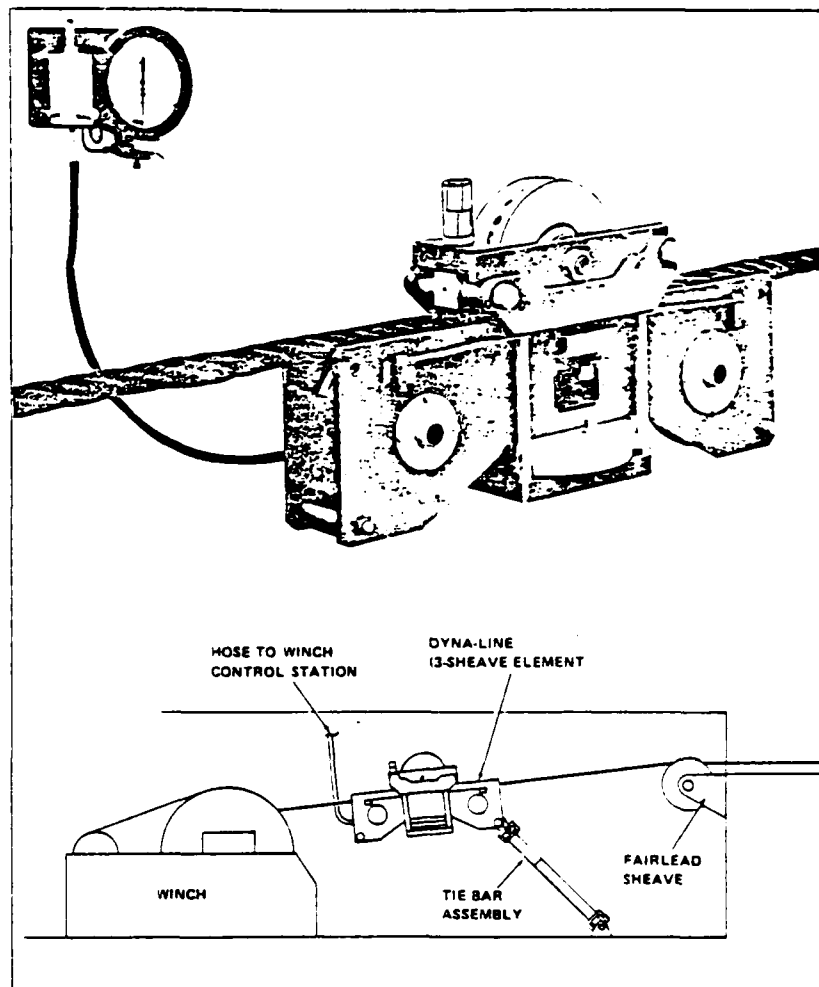


Figure 3-5 Running Line Dynamometer

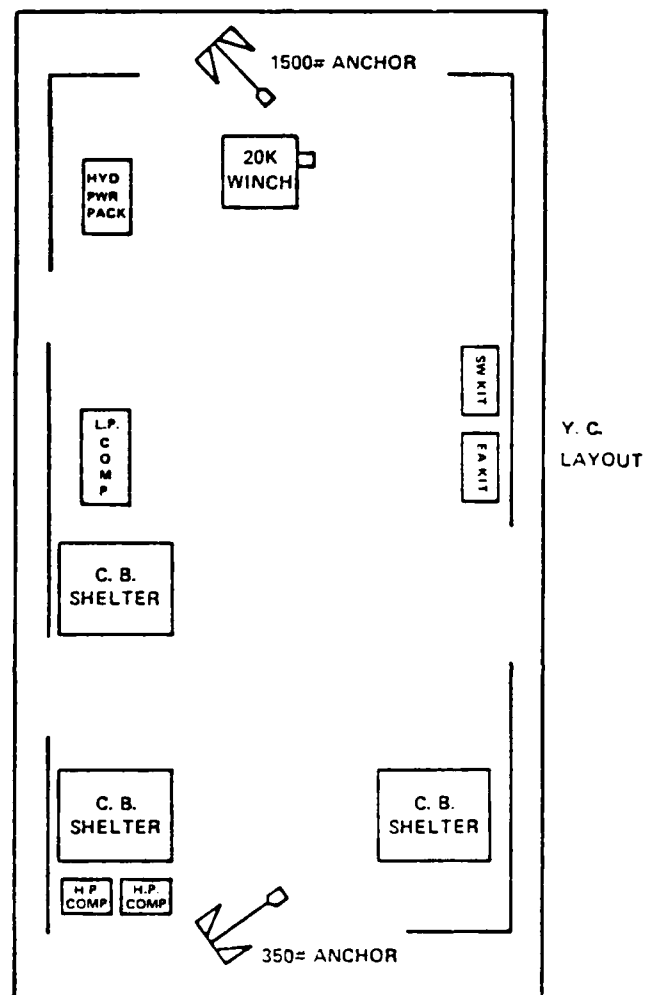


Figure 3-6. YC Barge Material Stowage

4.0 INSTALLATION PROCEDURES

4.1 Navigation for Mooring Installation.

4.1.1. Equipment. Navigation for the location of marker buoys and final position of the mooring will be done by theodolite. One of the Eagle 60 theodolites, supplied by OCEI, will have a Pulse Ranger Electronic Distance Measuring (EDM) unit mounted on it.

4.1.2. Locations of Survey Points. The primary sites for placing the survey gear are on the Coast Guard Light Tower at the foot of the damaged pier and Sprat Hall Theodolite Station (see Figure 4-1). There is no direct line

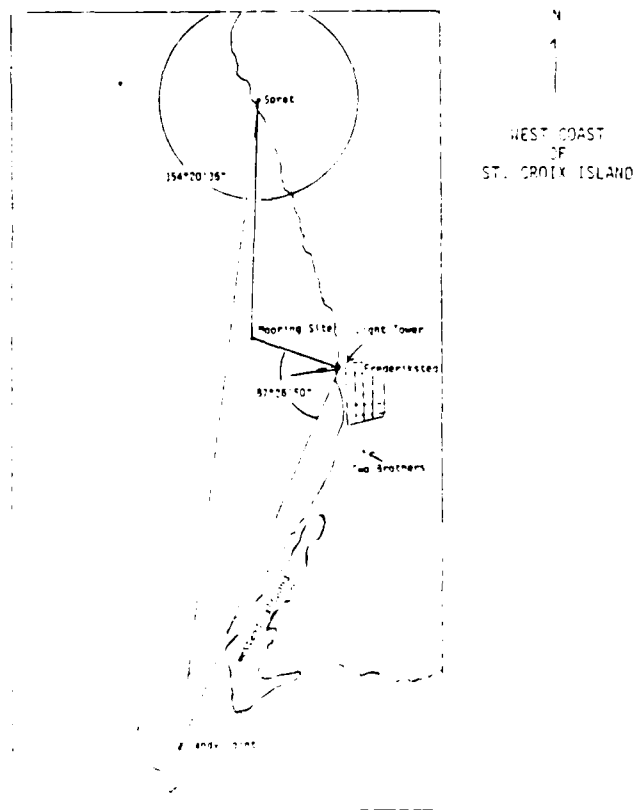


Figure 4-1. Locations of Survey Points

of sight between these stations, so Sandy Point Theodolite Station will be used as a backsite for both. The EDM gear will be placed at Sprat Hall. Table 1-1 in Section 1.0 gives the range and turning angle of the buoy and anchor locations from these two stations.

If the OCEI theodolites fail to operate, the UTR maintained theodolites will be used.

4.2 Intallation of Marker Buoys. Divers from UCT ONE will participate in the marker buoy installations as follows:

- o Mark the anchor sites and buoy location using spar buoys made from 3-inch PVC pipe 20-feet long.

- o A diver will be used to critically place the sinkers of the marker buoys to ensure that they are on a level, obstruction free area. A tolerance of ± 20 feet is acceptable based on the original tasking and design (see Figure 4-2). If the markers must be moved, they should be moved toward the center marker buoy and the exact distance noted.

4.3 PEA Installation.

4.3.1 Anchor Firing All three PEAs will be fired into the bottom before a pull test is conducted. In order to ensure that the two deep-water anchors are successfully installed, the anchors for legs 2 and 3 will be fired first followed by the shallow-water anchor for leg number 1. The following steps will be followed in firing the anchors:

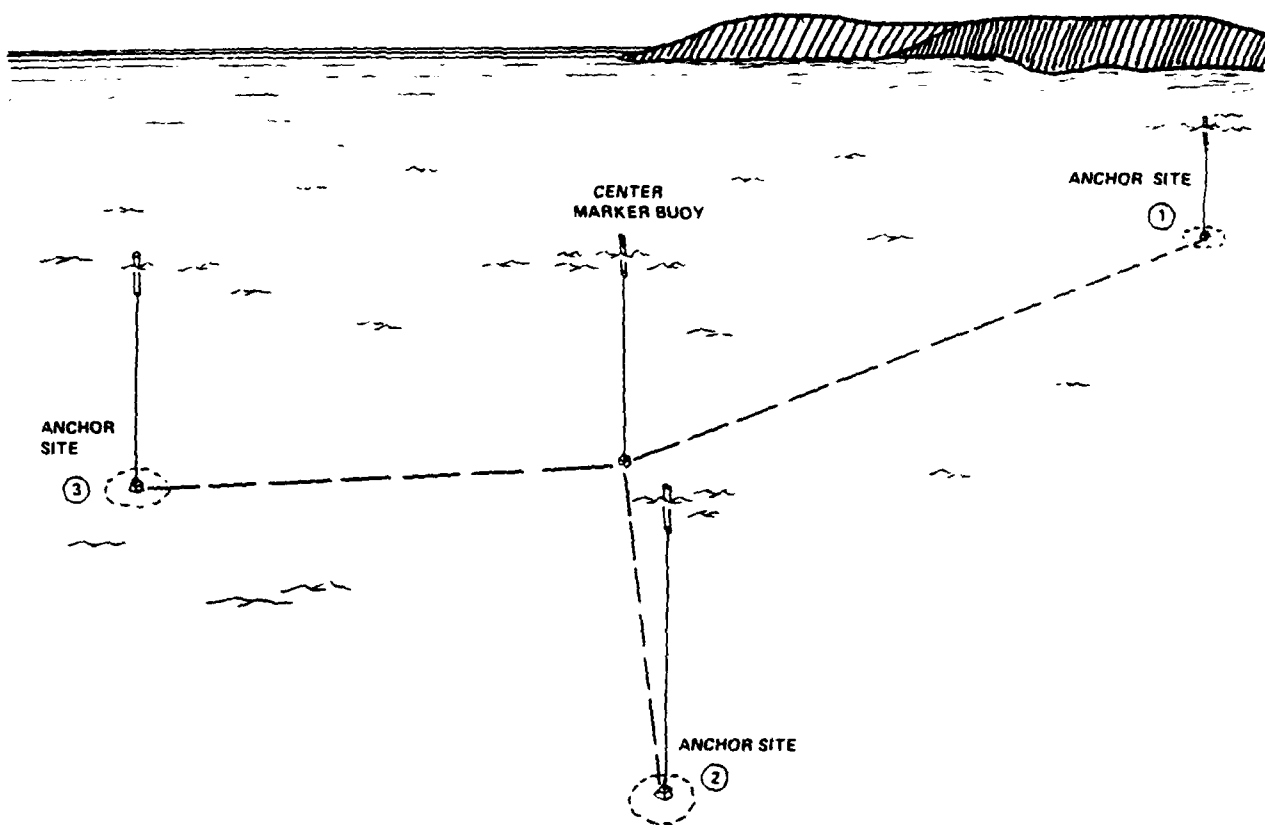


Figure 4-2. Center and Anchor Marker Buoy Positions

Step One

- o Initiate Ordnance Handling Condition
- o Prepare PEA for firing in accordance with the "100K PEA INSTALLATION, OPERATION AND MAINTENANCE MANUAL."
- o Connect a 120-foot downhaul wire rope pendant to a 50-foot wire rope downhaul cable and stopper the rest of the pendant over the port side after

removing the port gunwale. Stopper the bitter end on deck as shown in Figure 4-3.

Step Two

o Position SEACON so that anchor site number 2 is off the port side and the bow heading toward the center marker.

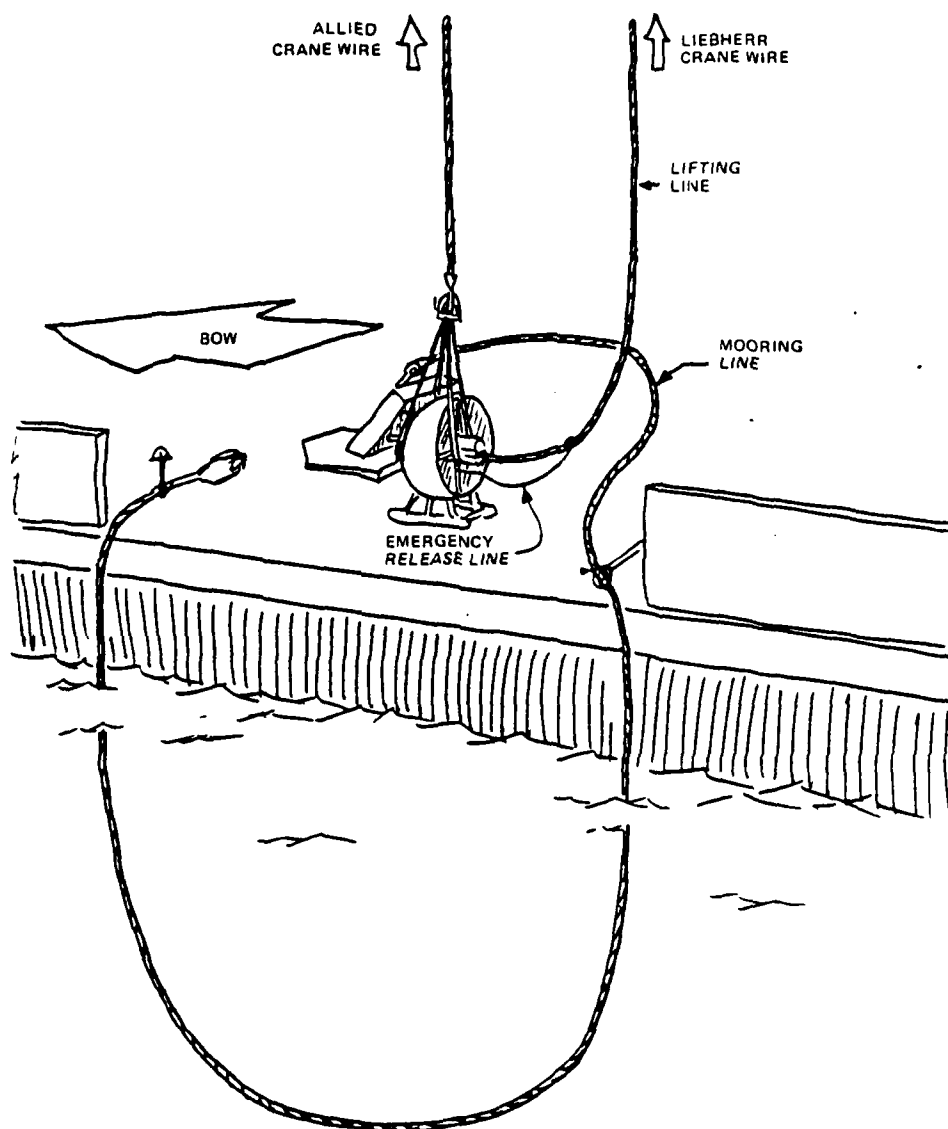


Figure 4-3. Preparing a PEA for Overboarding

- o Determine the depth of water, subtract 20 feet, and mark the Liebherr wire at that depth.

- o Rig the PEA with the Allied crane wire attached to the lifting sling and the Liebherr crane wire attached, as the lifting line, to the 20-foot nylon shock line which is attached to the lifting harness. Stopper the emergency release line to the nylon shock line as shown in Figure 4-4.

- o Using the Allied crane on the port side of SEACON, lift the PEA horizontally off the deck.

- o Transfer the load to the Liebherr by lowering the line on the Allied, thereby shifting the gun to the vertical.

- o Disconnect the Allied crane wire and remove the lifting sling.

- o Rig the downhaul cable pendant to the Allied in such a manner that allows controlled lowering and keeps it clear of the side. A constant tension should be kept on the pendant so that the anchor fluke remains perpendicular to the final direction of the load.

- o Swing the PEA over the port side and walk the Liebherr aft (see Figure 4-5).

- o Lower the gun to the bottom with the Liebherr crane while letting out on the downhaul pendant.

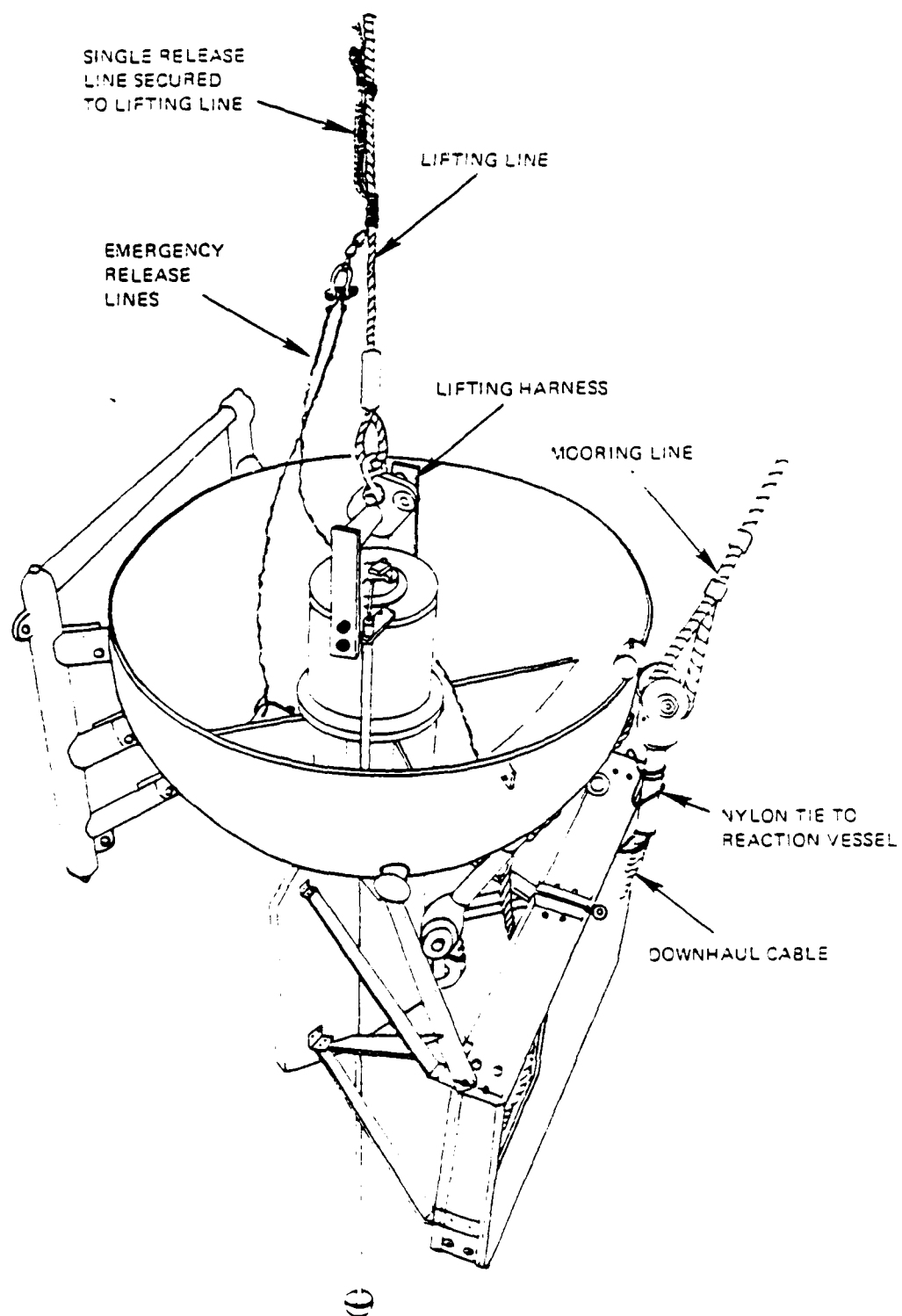


FIGURE 4-4. Rigging the Propellant Embedment Anchor

- o Stop the PEA 20 feet from the bottom until the final word to lower and fire is given.

- o Lower and fire the PEA.

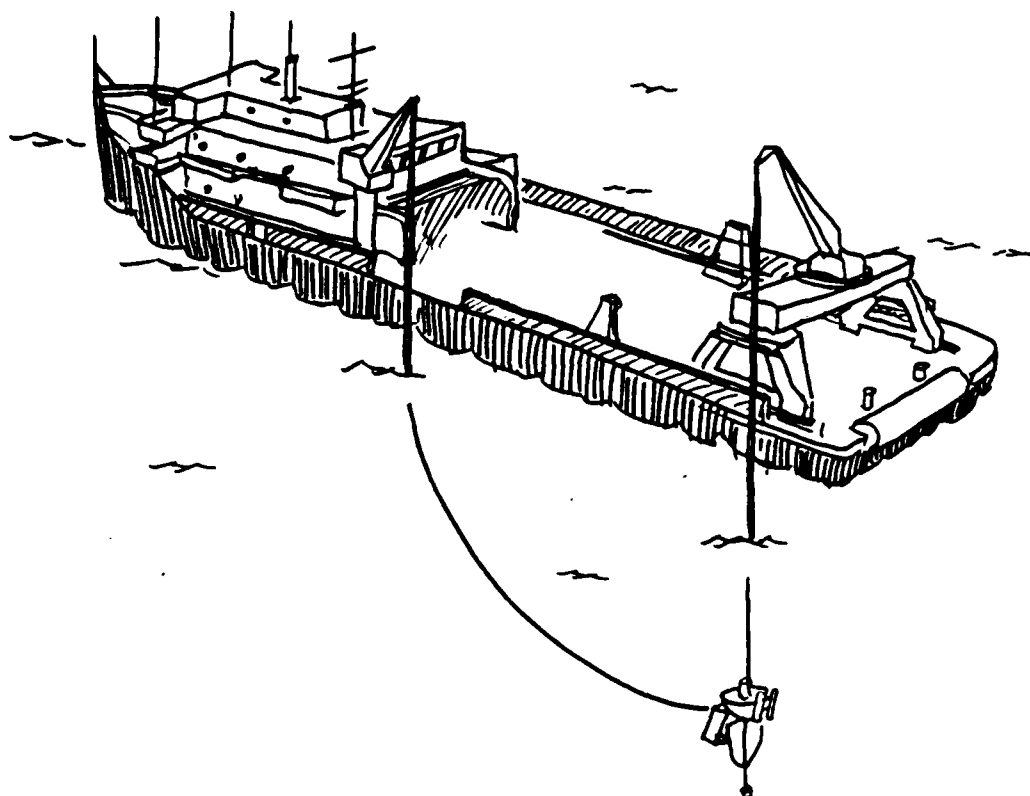


Figure 4-5. PEA Ready for Lowering to the Bottom

Step Three

- o After the anchor is fired, retrieve the gun, allow it to drain, and place it on deck. Remove the marker buoy.

o Transfer the downhaul pendant to the Liebherr, attach a tag line, and walk the pendant to the stern of the SEACON where the pendant will be brought on deck so a retriever buoy can be attached. (Note: Because of the long pick up lines and the water depth it may be more feasible to lower the pendant on the Allied and then throw the line off the port side without having to walk it to the stern.)

o Attach a float to the end of the pendant with four 40-foot sections (two sections for the pendant of anchor number 1) of 3/4-inch wire rope. Rig a "lazy pendant" in line so the pendant can be used for lifting as shown in Figure 4-6).

o Lower the wire rope pendant with the Liebherr. Lower the line to the last section, stoppering and retracting the Liebherr as necessary.

o Stopper the buoy pendant with a quick release.

o Release the quick release. Throw the buoy clear of the stern roller.

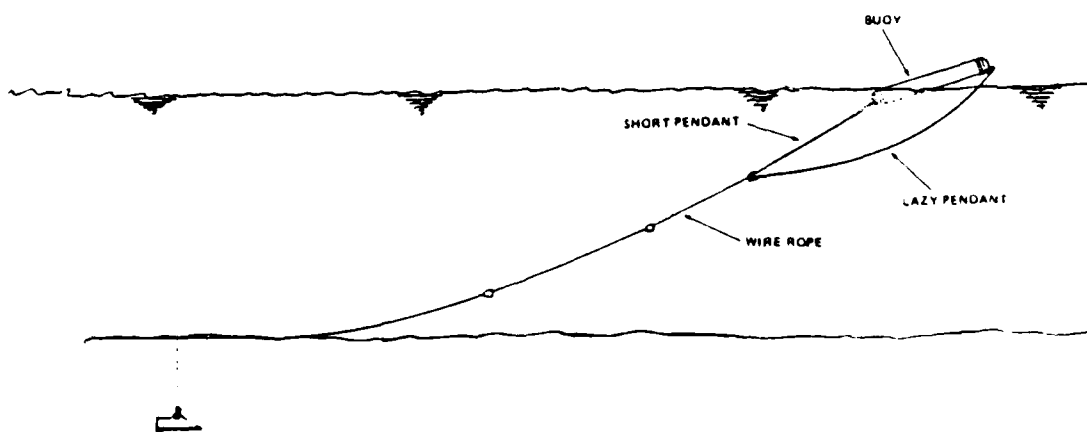


Figure 4-6. Lazy Pendant and a Retriever Buoy

Step Four

- o Repeat the above procedures for anchors number 1 and number 3 (see Figure 4-7).

Step Five

- o Secure the PEA equipment.
- o Stand down from the Ordnance Handling Condition.

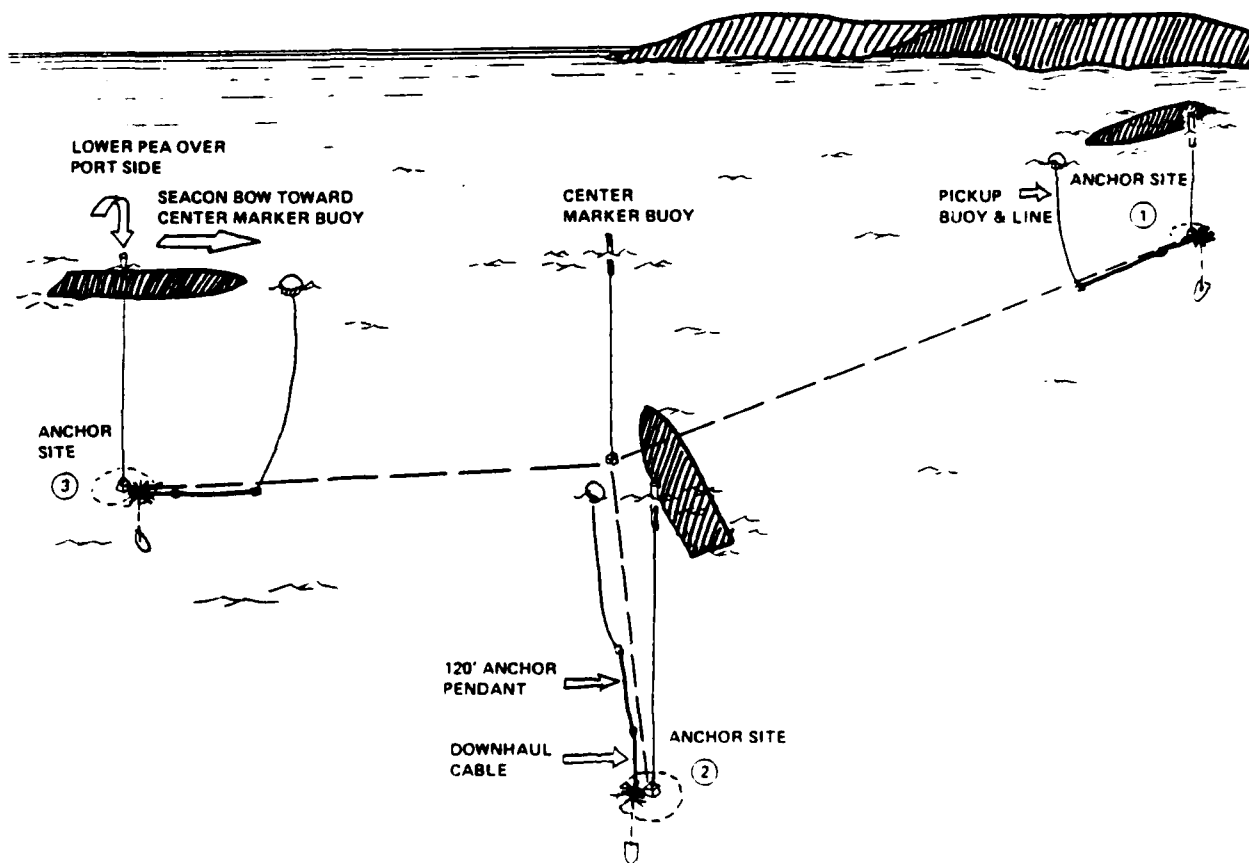


Figure 4-7. Anchors and Wire Pendants Installed

4.3.2 Diver Inspection. Divers will inspect the anchor just fired while SEACON moves toward the next site.

- o A careful inspection of the wire rope near the crater shall be made to determine whether or not the pendant was damaged during firing. Refer to the "Fleet Mooring Underwater Inspection Guidelines."

- o A measurement will be made from the point of penetration to the swage fitting connecting the downhaul cable to the 120-foot pendant to determine the depth of penetration.

4.3.3 Pull Test. A pull test to 50 KIPS will be performed on each PEA following the installation and diver inspection of all anchors. The pull tests will be accomplished as follows:

Step One

- o Position SEACON so that the retrieval lines on the pendants can be picked up.

- o Pull in the sections of the pickup line, stopper, and rehook. Repeat.

- o Retrieve the pendant and attach it to the purchase of the beach gear with a carpenter stopper.

- o Tension the beach gear so that the pendant tends vertically from the stern roller. A antiroll bar should be attached to the traveling block to prevent it from spinning when under load.

- o Measure the distance from the water level to the end of the pendant to determine the amount of anchor penetration. This will act as a backup to the measurement the divers make.

- o Mark the pendant on deck near the stern roller with spray paint.

- o The pull test is performed in two increments of 25 KIPS until the 50 KIPS are reached. The 50 KIPS (± 5 KIPS) tension will be held for 1 minute.

- o When a tension of 50 KIPS is reached, another mark will be made to determine how far the mark on the pendant has moved from the original mark on the deck. This will indicate the amount the anchor moved during keying.

Step Two

- o Due to the verticality of the wire rope anchor pendant during the pull test of each PEA, the stern roller of SEACON will be directly over the anchor's position. During these tests, sightings from ashore Theodolite Stations to the stern of SEACON should be taken to determine the final position of each anchor.

Step Three

- o Place the pendant back in the water using the Liebherr and the same method used to retrieve it.

- o The divers will recheck the amount of penetration and movement during the keying operation while SEACON moves to the next site.

Step Four

- o Repeat the above procedures for the other two anchors.

4.4 Chain Installation.

4.4.1 Leg Number Two. Following the pull test of anchor number 1 and while the divers are measuring the movement due to keying, move SEACON to the retriever buoy on pendant number 2. At this time, an engineering analysis will be made to determine the exact lengths of each leg. The following steps will be followed during the chain installation:

Step One

- o Retrieve the pendant as before. Stopper the pendant to the 100-ton padeye.

- o Range one or two shots of chain on the after deck and stopper them to the padeyes as shown in Figure 4-8.

- o Connect an anode, a 2 1/4-inch swivel, and a shot of chain to the swage fitting.

- o Weld a piece of flat bar across the end of the swage fitting pin.

- o Hook the purchase of the beach gear into the bight of chain using the pelican hook.

- o Retract the purchase of the beach gear, remove the carpenter stopper, and lower one bight of chain.

- o Stopper the chain to the 100-ton padeye using a pelican hook and

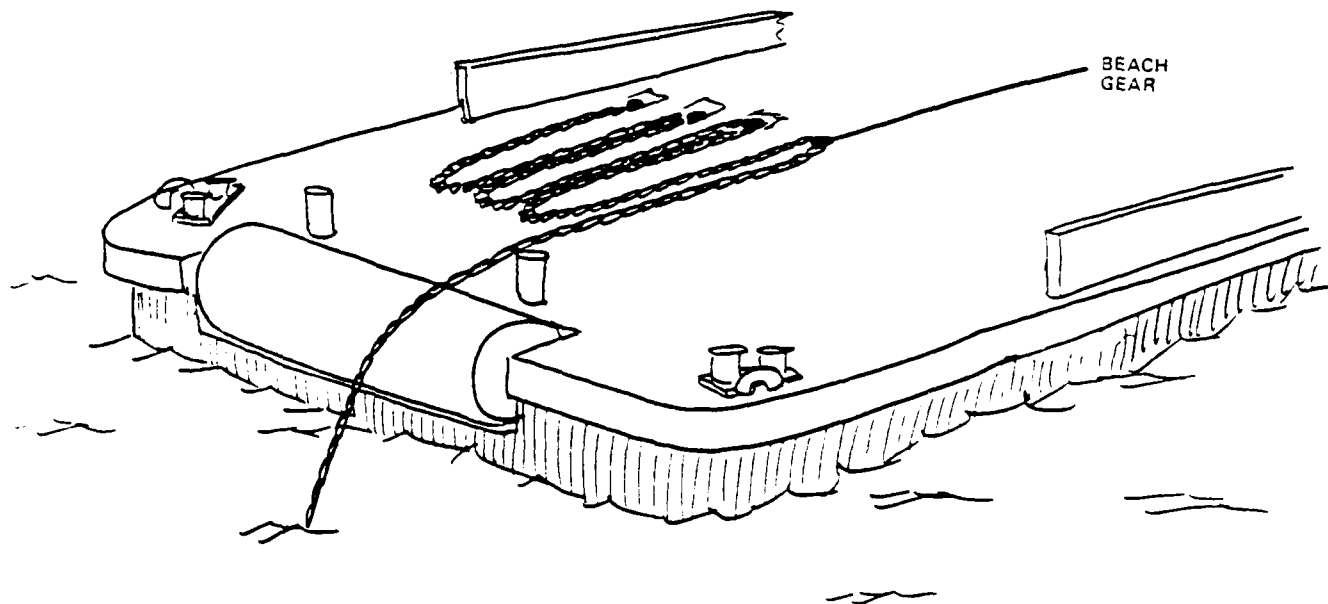


Figure 4-8. Stoppering Chain to the Deck Padeyes

reattach the purchase of the beach gear to the next section of the chain (see Figure 4-9).

- o Take a strain and release the chain stopper.

Step Two

- o Move SEACON toward the retriever buoy on pendant number 3.
- o Repeat the steps above for all four shots of chain, one of which will be subsequently removed. The purpose of this extra shot of chain is to prevent the possibility of overloading the pickup line. Leg numbers 1 and

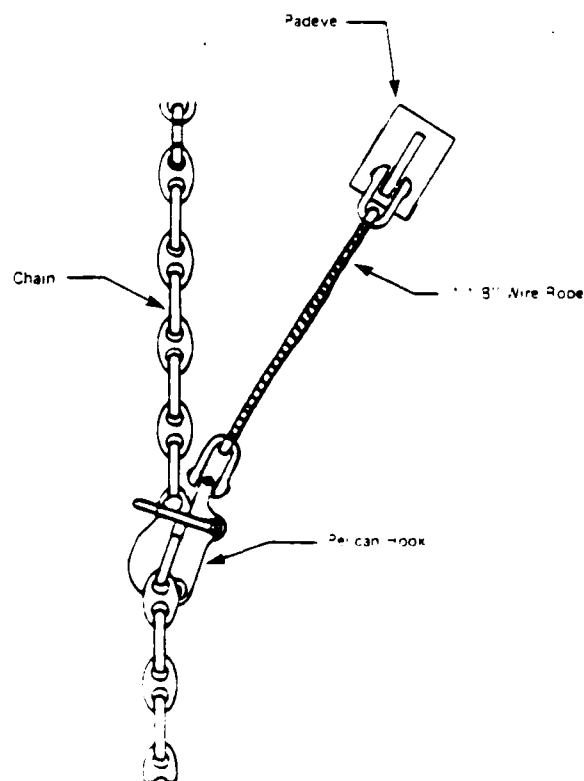


Figure 4-9. Deck Chain Leg Number 3

3 will not require an extra shot at this time, and the above steps will be repeated for only three shots of chain.

o Lower the last section of chain on the purchase of the beach gear until the end of the chain is near the 100-ton padeye and stopper it off.

Step Three

o Attach a retriever buoy pendant to the bitter end of the chain and lower the pendant as was done previously (see Figure 4-10).

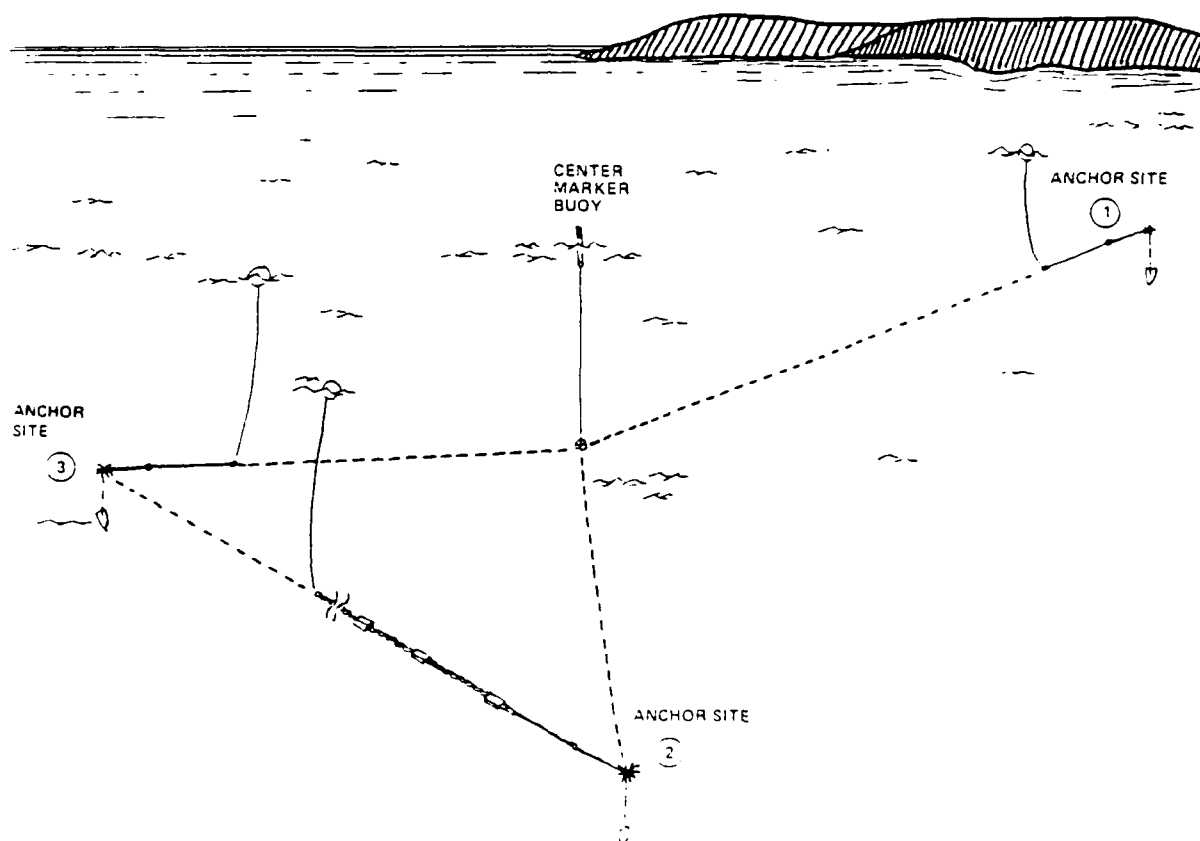


Figure 4-10. Leg Number 2 Chain on the Bottom

4.4.2 Leg Number Three and Ground Ring.

Step One

- o Move SEACON to anchor pendant marker buoy number 3.
- o Retrieve the pickup line.
- o Retrieve the pendant for anchor number 3 and repeat the steps for anchor number 2 until the bitter end of the last shot of chain is near the stern roller.
- o Cut off the amount of chain specified by the design engineer.

Step Two

- o Attach the ground ring and stopper it off to the 100-ton padeye (see Figure 4-11).

4.4.3 Return to Leg Two. SEACON should be near the retriever buoy on anchor chain number 2.

Step One

- o Retrieve the pendant as before.
- o When the bitter end of the chain is on deck, stopper it off, several links back from the end, to the starboard 50-ton padeye. Remove the pickup buoy and wire.

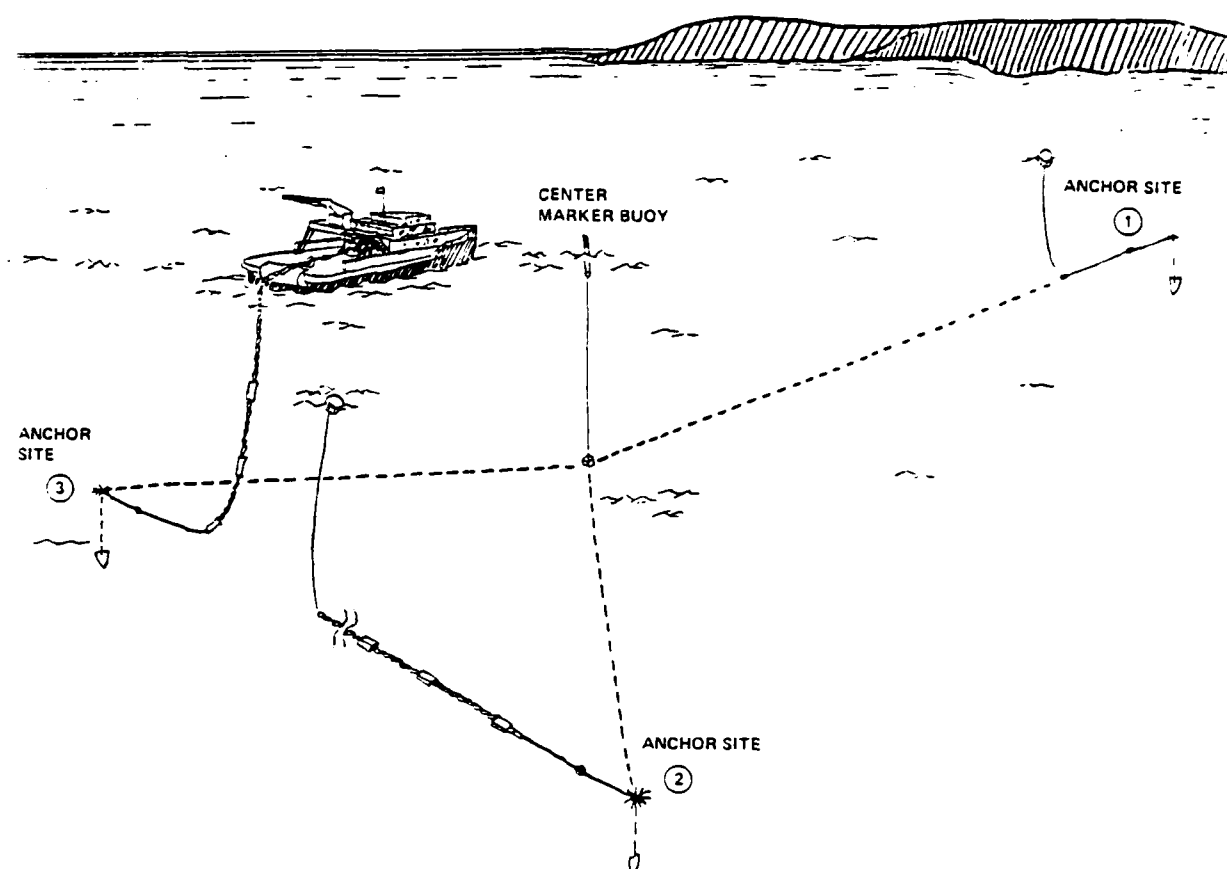


Figure 4-11. Installation Chain Leg Number 3

Step Two

- o Rig the chain to the purchase of the beach gear through the ground ring as shown in Figure 4-12. A tension of 10 KIPS is then applied to leg 2 until the designated amount of chain is pulled in. (This will include the extra shot of chain).

- o Stopper the chain to the starboard 50-ton padeye outboard of the ground ring.

- o Cut the chain near the ground ring and attach it with an anchor joining link to the ground ring.

4.4.4 Attaching Leg Number One

- o Attach a shot of the chain for leg number 1 to the ground ring. Range the chain on deck as before.

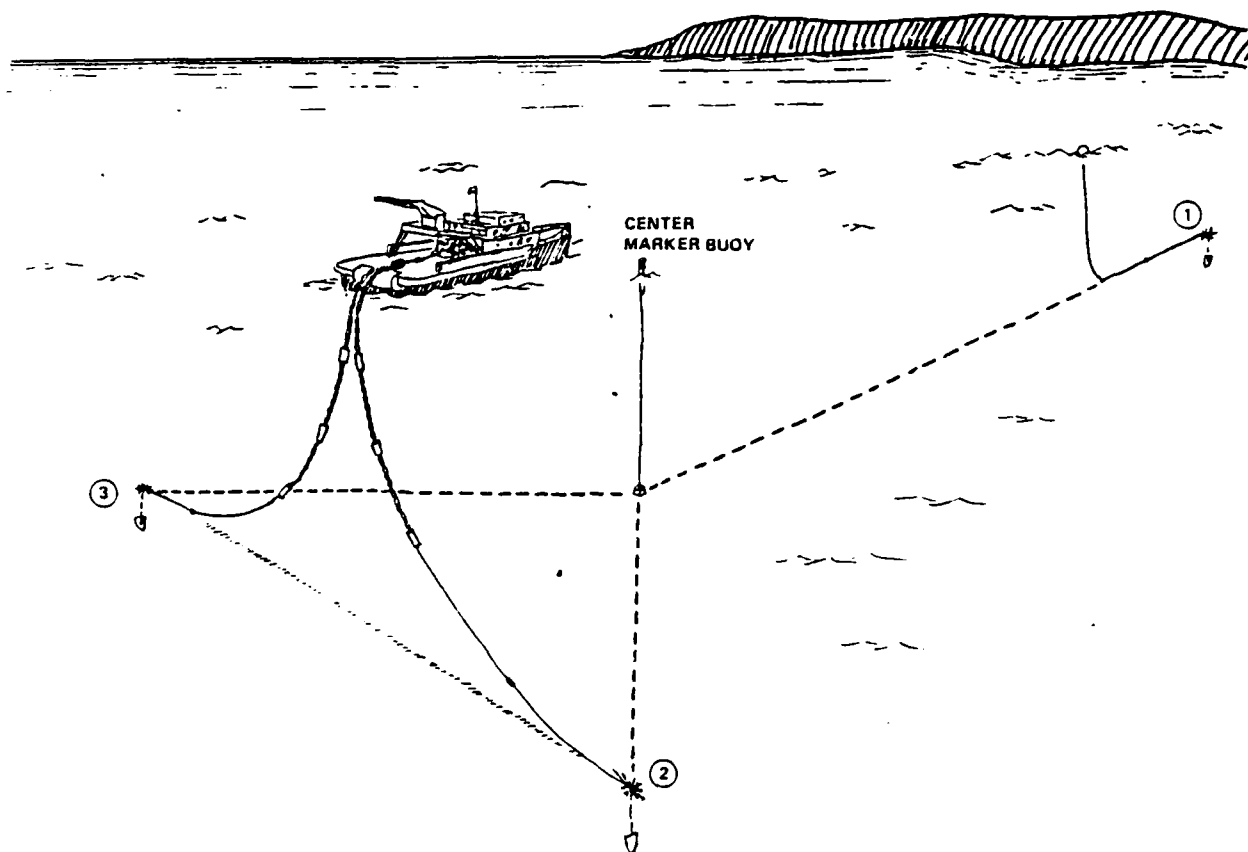


Figure 4-12. Rigging Leg Number 2 to the Beach Gear

- o Attach the purchase of the beach gear to a bight of the chain and take a strain on the chain (see Figure 4-13).

4.4.5 Sinker Anchor

- o Pick up the 16K sinker anchor with the Liebherr and connect it to the ground ring forward on the port side.

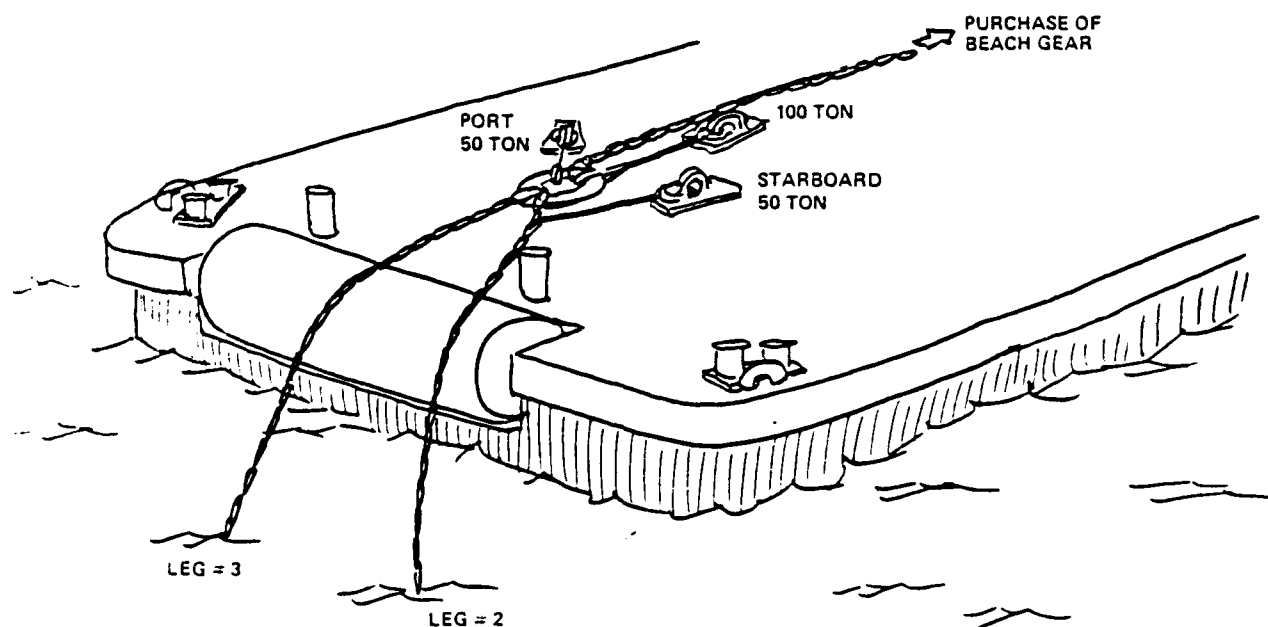


Figure 4-13. Attaching the Chain to the Beach Gear

4.4.6 Riser Chain Attachment

Step One

- o Connect the riser to the ground ring.
- o Stopper off the riser to starboard quarter bitts to prevent it from running.

Step Two

o Pick up the stoppered section of riser with the Liebherr and place it over the starboard quarter as shown in Figure 4-14.

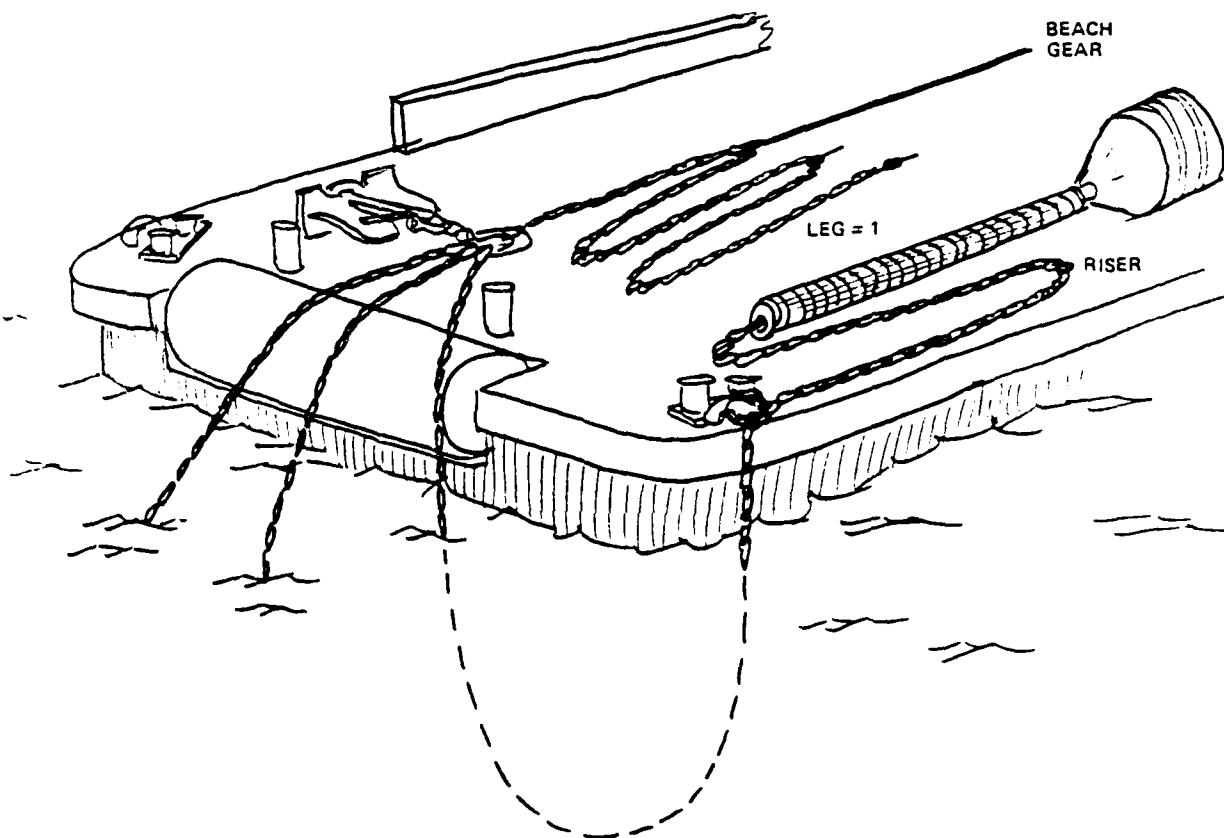


Figure 4-14. Placing a Riser Section over the Starboard Quarter

Step Three

o Pick up sections of the riser and overboard with the Liebherr. Each section must be stoppered to prevent running.

o Pick up the buoy and riser fender system and overboard on the starboard side. Have a line connected to the top of the buoy so it can be secured to the starboard quarter bitts.

4.4.7 Overboarding Assembly.

Step One

o Attach the wire from the Liebherr to the 16K anchor with a "toggle release" mechanism. Lift the anchor off the deck. See Figure 4-15.

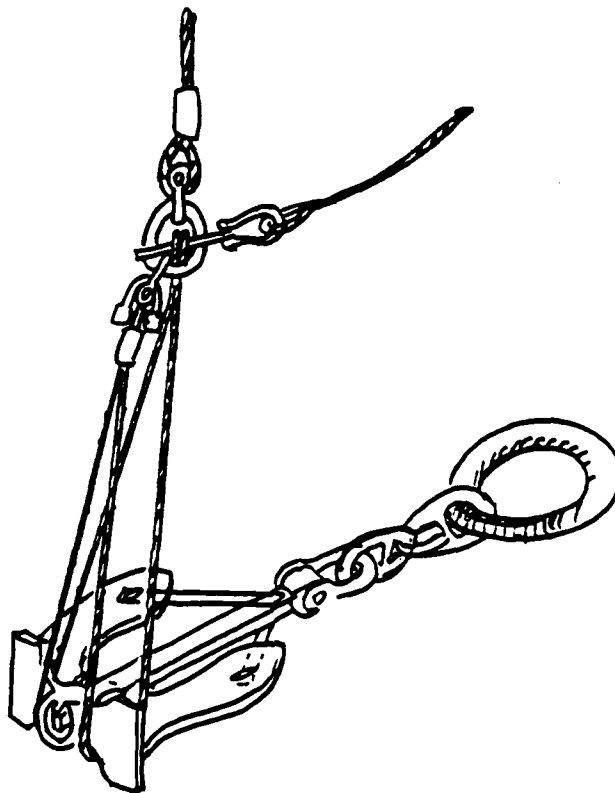


Figure 4-15. Toggle Release Mechanism on the Anchor Sinker

o Take up on the beach gear and release the ground ring from the 100 ton padeye, leg number 2 from the starboard 50-ton padeye, and leg number 3 from the port 50-ton padeye.

Step Two

o Lower on the Liebherr while letting out on the purchase of the beach gear. Overboard the ground ring and anchor.

o Let the anchor hang from the ground ring and trip the toggle release.

o Let out on the purchase of the beach gear until it nears the stern roller (see Figure 4-16).

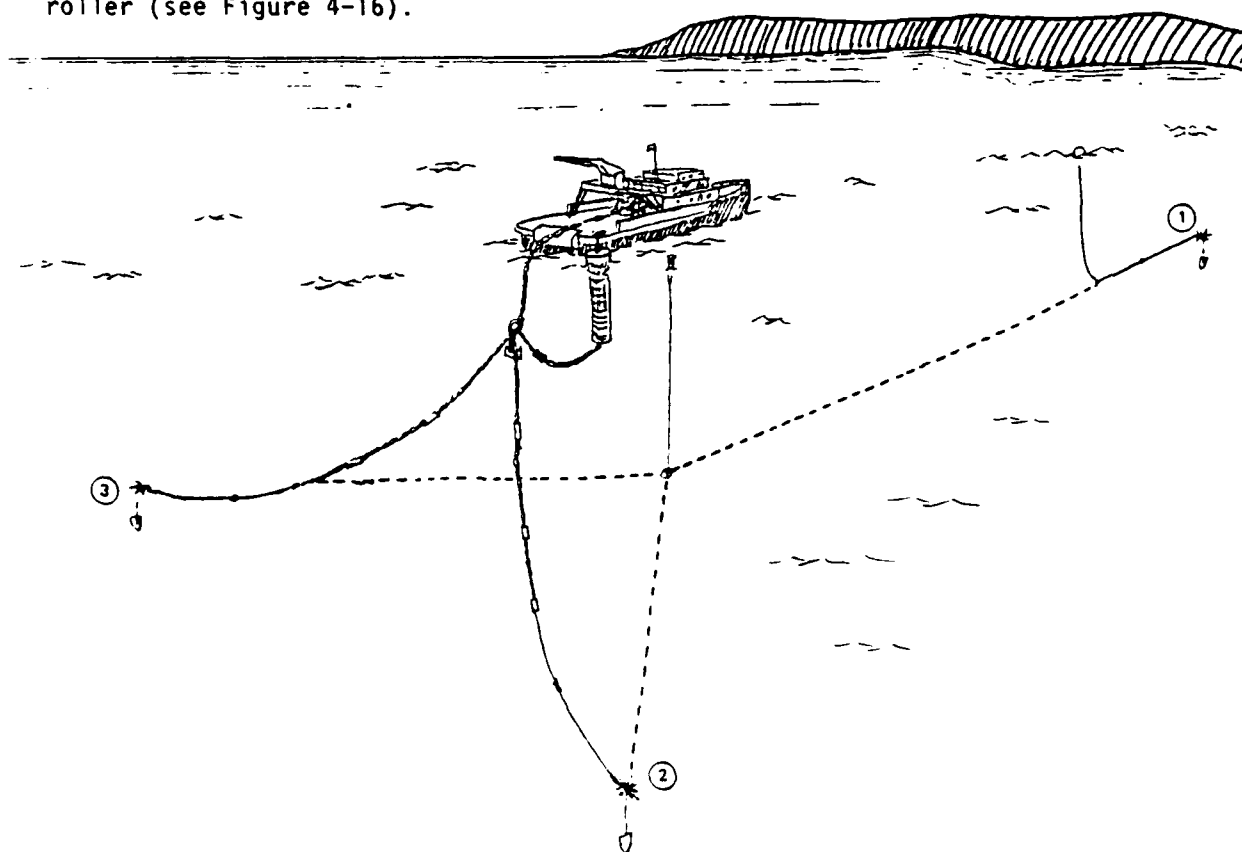


Figure 4-16. Buoy, Riser, Ground Ring in the Water

- o Release the line holding the buoy.

- o Stopper off the chain to the 100-ton padeye, retract and rehook the purchase of the beach gear, release the stopper and continue lowering. At this point, SEACON must maintain a constant force of approximately 10 KIPS as it moves toward anchor number 1.

Step Three

- o When the bitter end is near the stern, stopper off the chain to the 100-ton padeye.

4.4.8 Leg Number One

Step One

- o Attach the next shot of chain to the first shot and lower as explained before. Do not place an anode between the first and second shots of chain.

- o Attach an anode and the third shot of chain and lower until the end of the chain is near the stern roller (see Figure 4-17).

- o Stopper the chain to the 100-ton padeye.

- o Attach a retriever buoy and overboard the three shots of chain as described before (see Figure 4-18).

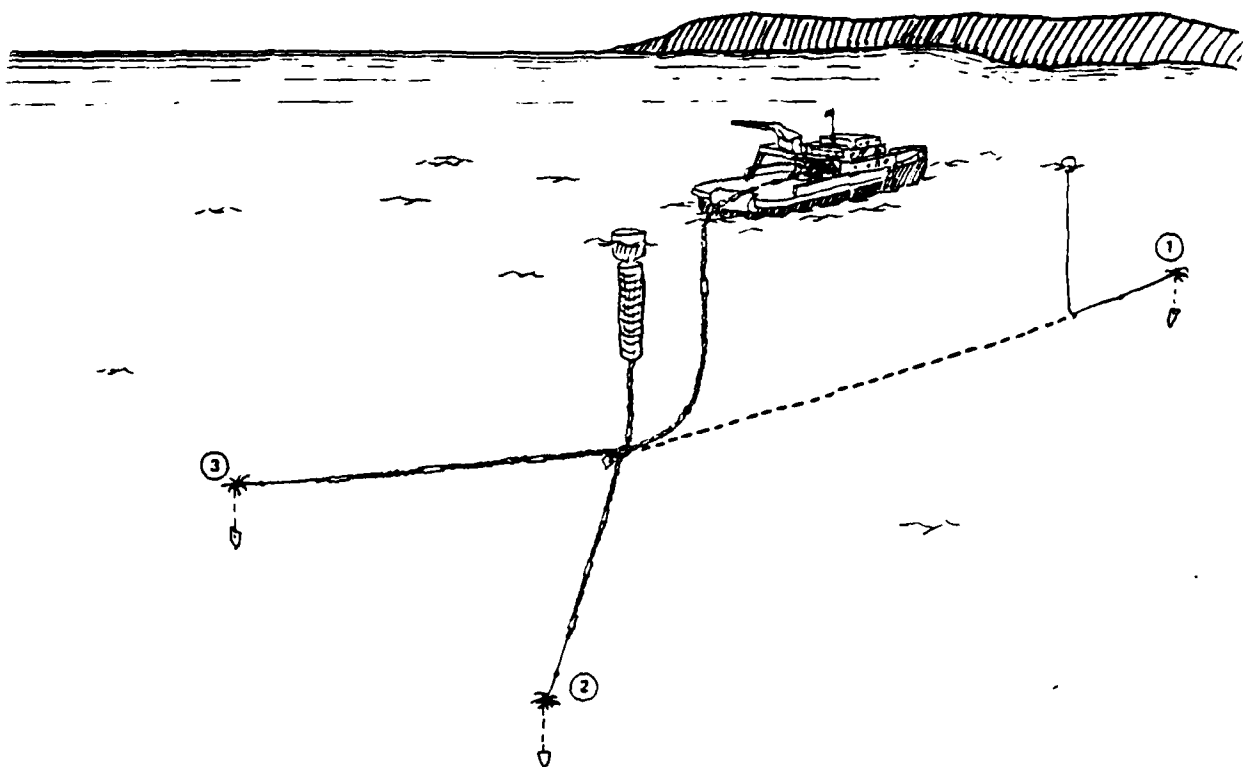


Figure 4-17. Lowering Leg Number 1

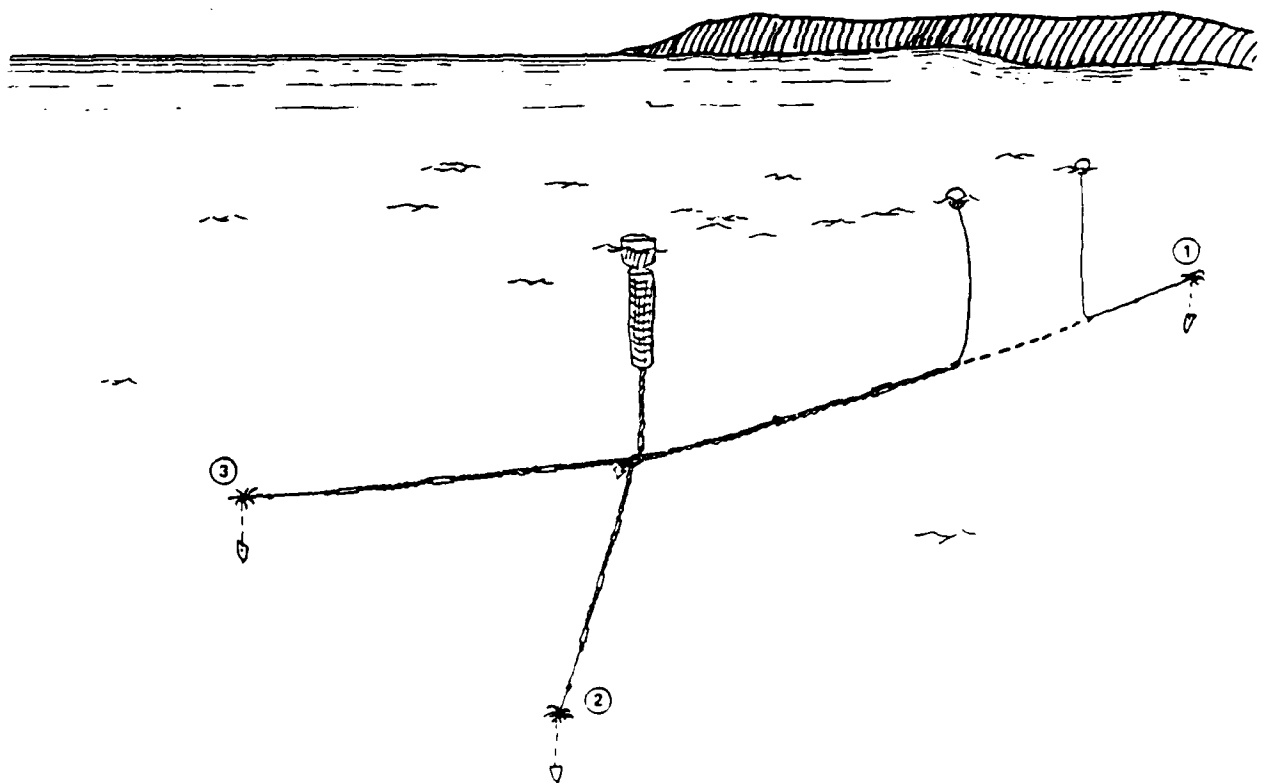


Figure 4-18. Three Shots of Leg Number 1 in Place

4.4.9 Attaching Chain to the Pendant of Anchor Number One

Step One

- o Retrieve the pendant of anchor number 1, and stopper to the 100-ton padeye with a carpenter stopper.

- o Attach the anode and swivel.

Step Two

- o Range a shot of chain on deck as before.

- o Attach the shot of chain and hook it to the purchase of the beach gear.

- o Tension the purchase of the beach gear, remove the carpenter stopper, and replace it with a pelican hook. Note: The Liebherr may be used at this point, rigged through a block on deck as before.

Step Three

- o Let out on the purchase of the beach gear while moving SEACON toward the marker buoy on the three shots of chain. Repeat the above steps until the bitter end of the chain is near the stern roller (see Figure 4-19).

o Stopper the chain to the starboard 50-ton padeye, being careful to leave a 5-foot tail free on deck. Release and retract the beach gear.

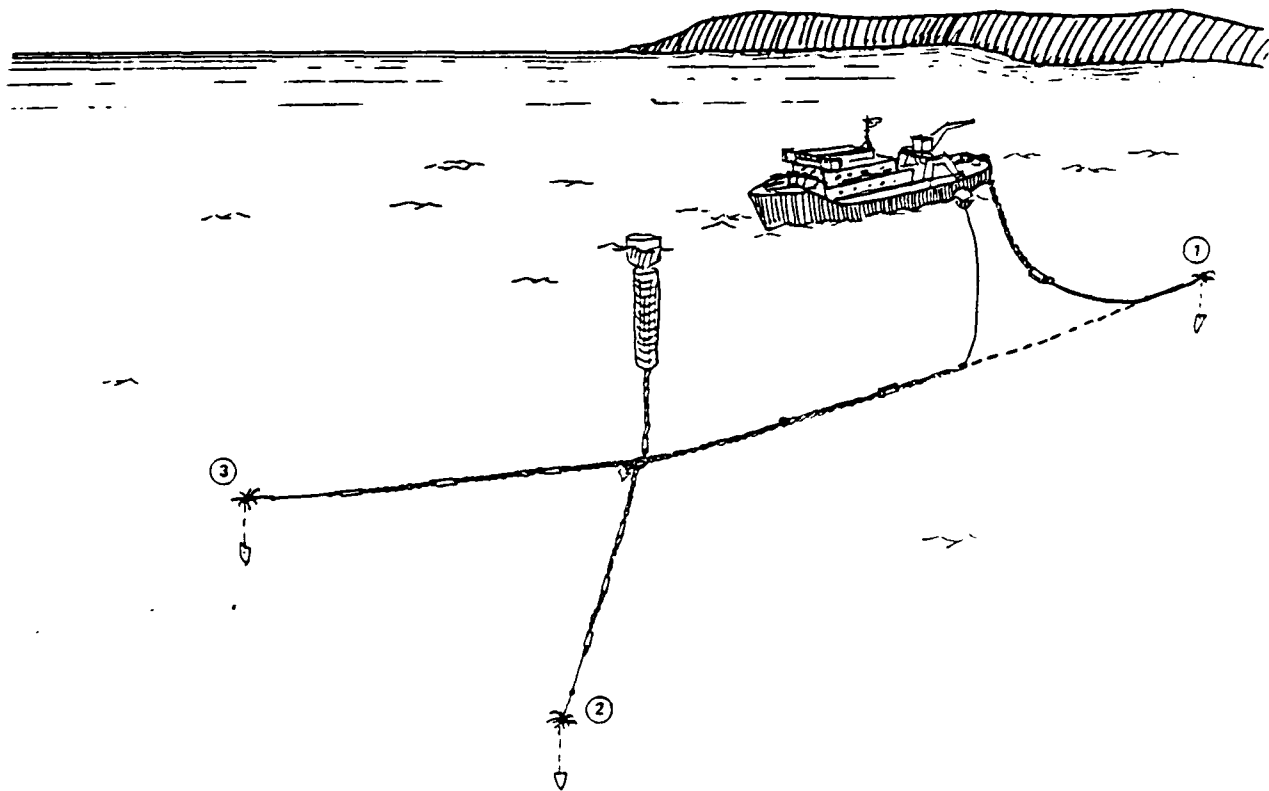


Figure 4-19. Preparing to Attach the Last Shot

Step Four

o At this point SEACON should be close enough to the retriever buoy on the three shots of chain so that it can be retrieved and stoppered to the 100-ton padeye.

- o Attach an anode and connect the chain stoppered to the starboard 50-ton padeye.

- o Attach the chain to the beach gear with a "toggle release" mechanism and three pendants as shown in Figure 4-20.

Step Five

- o Take in on the purchase of the beach gear, release the stopper on the 100-ton and 50-ton padeyes and lower the chain to the bottom.

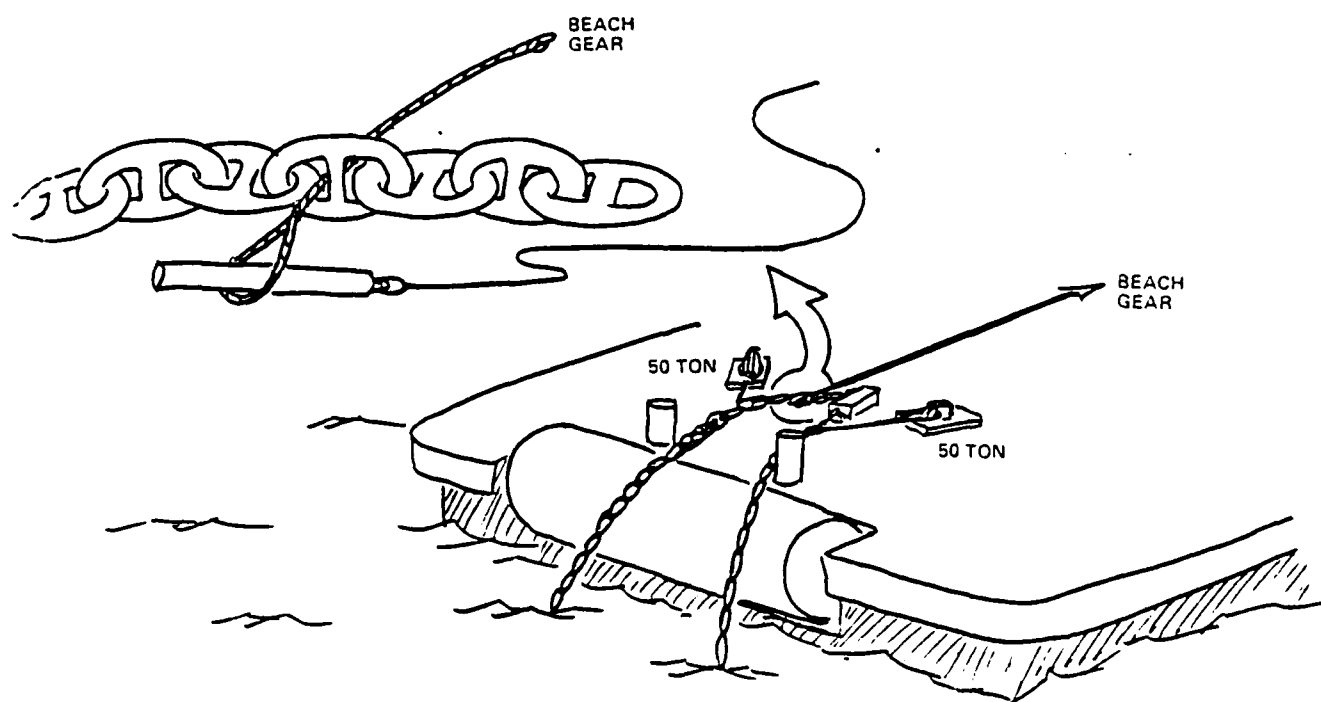


Figure 4-20. Beach Gear with Toggle Release Mechanism

Step Six

- o When the chain has reached the bottom, or is close to it, trip the "toggle release" mechanism by securing the toggle line so that the weight of the chain pulls the toggle out.

- o Retract the purchase of the beach gear.

5.0 BUOY LOCATION

- o Using EDM and theodolite equipment, determine the final position of the mooring. See Section 4.1.

6.0 POST INSTALLATION

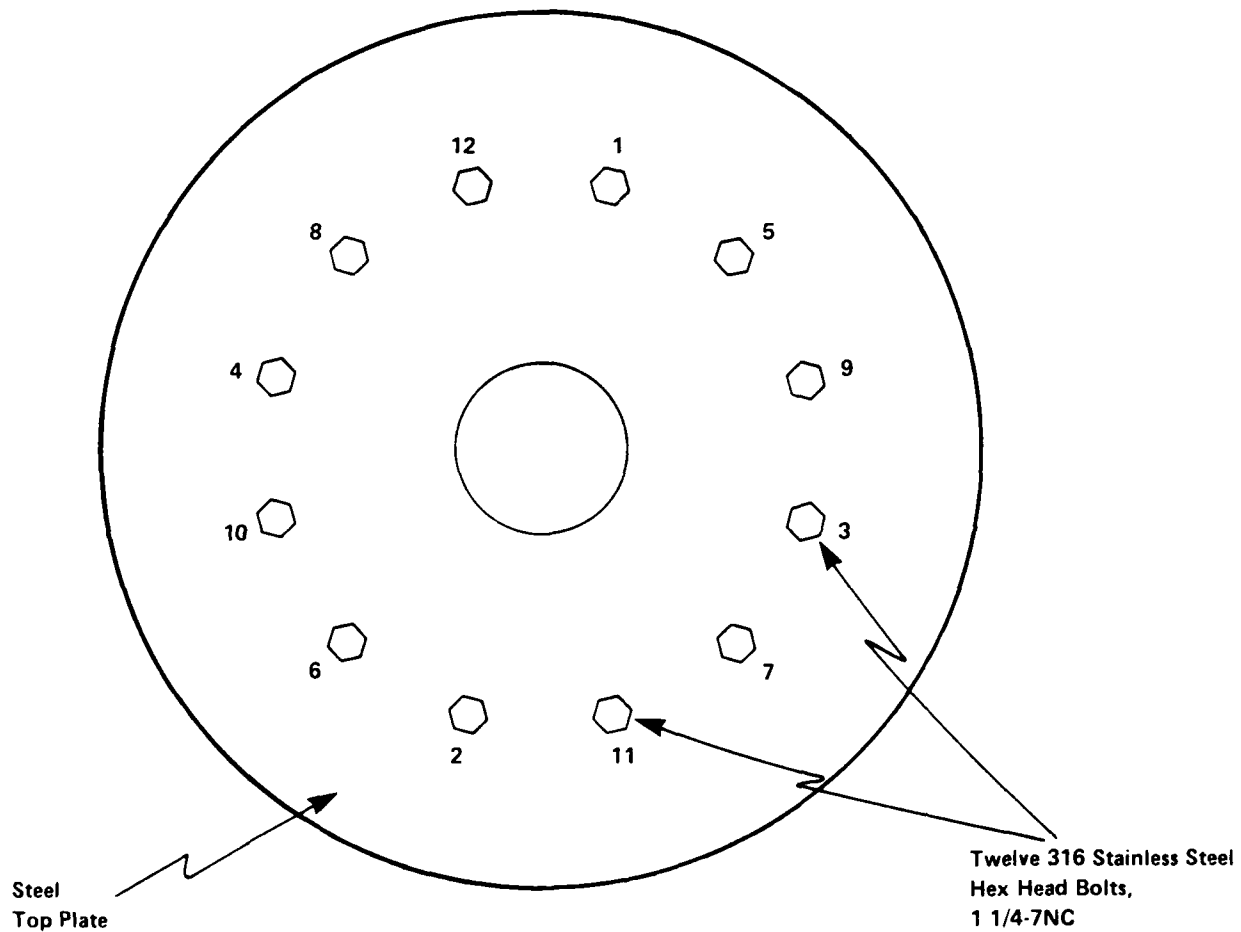
6.1 Post-Installation Inspection. Divers will conduct a final inspection of the mooring. This inspection dive will be conducted with both CHESNAV FACENGCOM and UCT One divers using the procedures outlined in the "Fleet Mooring Underwater Inspection Guidelines."

An underwater voltmeter will be used during this phase to determine the amount of protection provided by the anodes of the cathodic protection system. Again, the "Fleet Mooring Underwater Inspection Guidelines" provide a description of the methods to follow.

6.2 Buoy Torque. As a final check before leaving the mooring, the bolts on the top of the buoy must be torqued to 400 ft-lbs. Procedures for this operation will be provided by the buoy manufacturer and given to UTR following post installation torquing. See Figure 6-1 for the sequence to follow in torquing the bolts.

6.3 Mooring Hawser. The mooring hawser will be turned over to UTR and instructions for its care and preservation provided by CHESVNAV FACENGCOM.

BOLT TORQUING PROCEDURES FOR FLEET MOORING BUOY
SERIAL NUMBER MB 20-0101
Manufactured by Seaward International JAN 85



Torque bolts to 400 ft-lbs. Torque in sequence shown above, starting with any bolt. Do not fully torque using only one tightening sequence. Full torque should be achieved using at least two complete tightening sequences. Bolts should be retorqued annually.

FIGURE 6-1. Bolt Torquing Procedures

7.0 DEMOBILIZATION PHASE

Before SEACON returns to NAVSTA Roosevelt Roads, all project related material must be loaded on board for return to OCEI or to UCT ONE as appropriate. SEACON will transport the chain crates to Fort Lauderdale where they will be unloaded. These crates will be subsequently shipped to CBC Gulfport.

8.0 DOCUMENTATION

Project data, notes, logs, and photographs will be compiled to produce a Project Documentation Report which will be distributed to all interested activities within 90 days of project completion. This report will provide a detailed description of what materials were installed as part of the fleet mooring and a listing of all material as-built data. The report will also contain data on which to base inspections, repairs, and future systems modifications or upgrading of furnished components.

ANNEX A
ADDITIONAL DRAWINGS

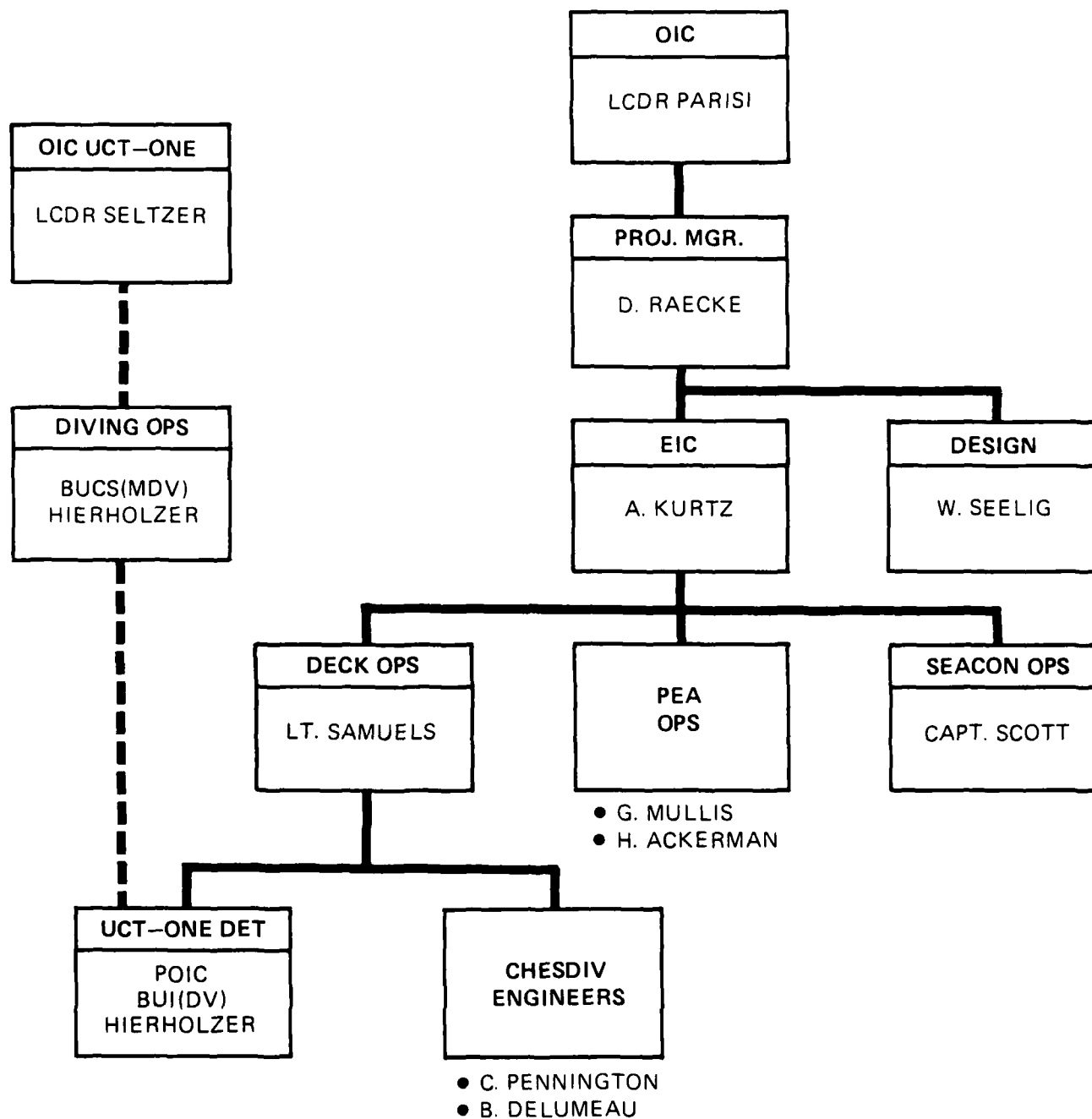


FIGURE A-1. St. Croix Program Organization Chart

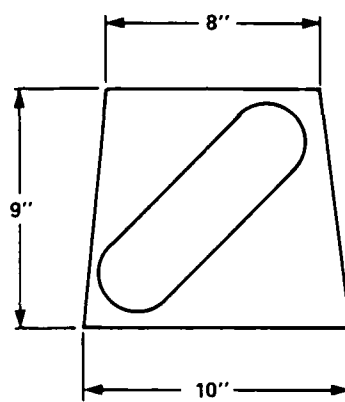
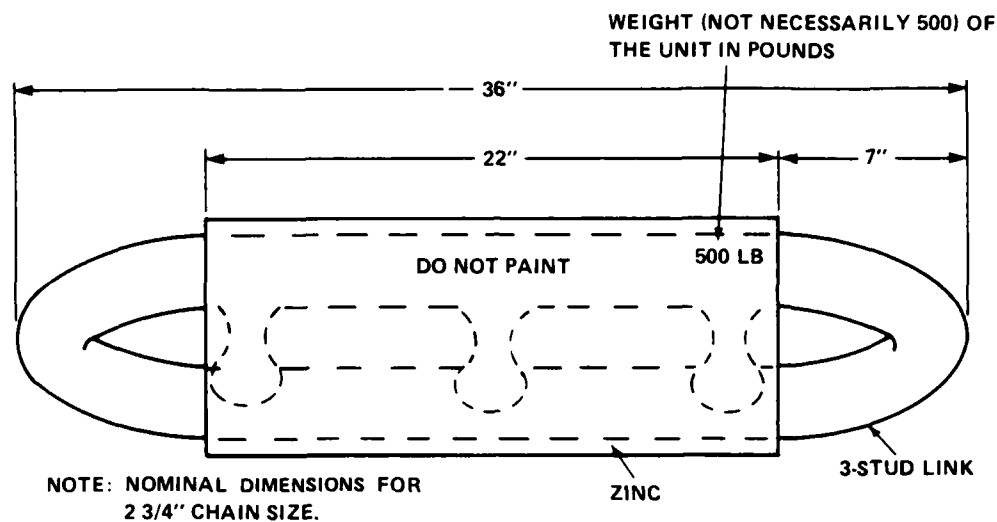


FIGURE A-2. In-Line Zinc Anode

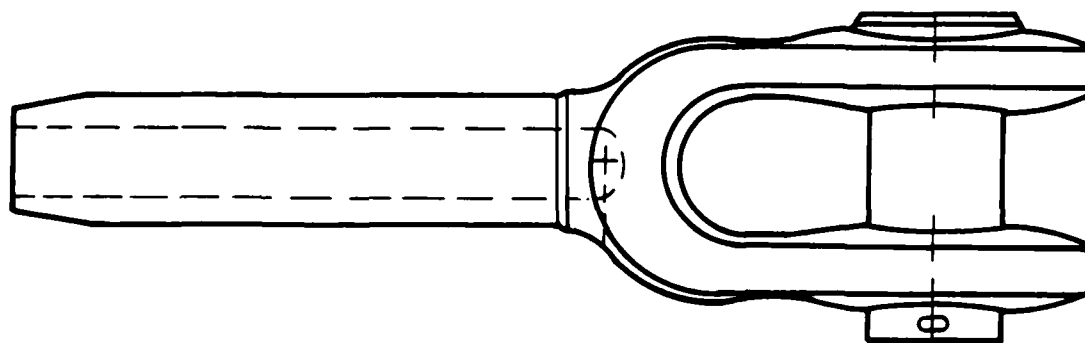


FIGURE A-3. Swage Fitting

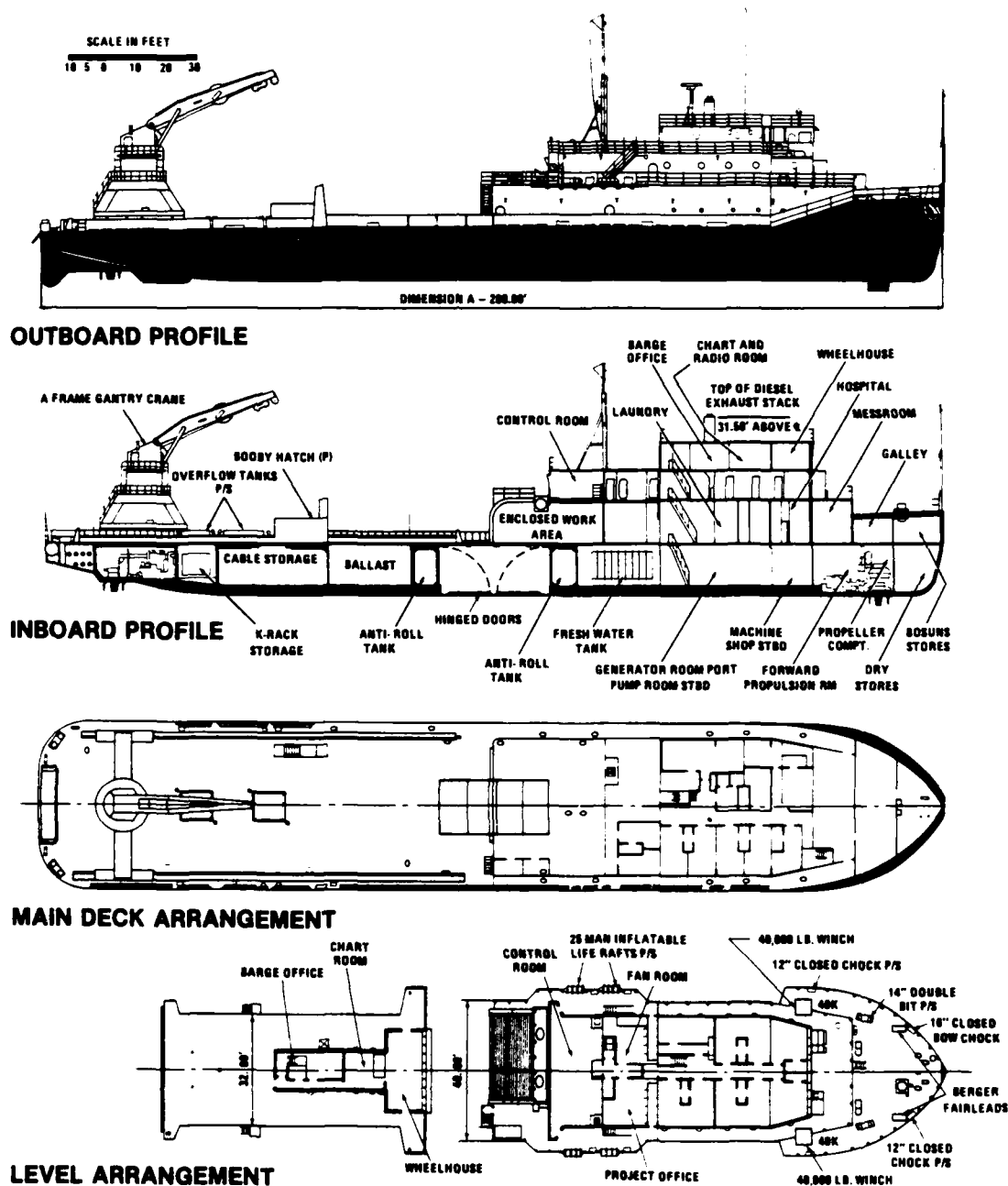


FIGURE A-4. Profile of the OCP SEACON

ANNEX B

MATERIAL REQUIREMENTS

MATERIAL SHIPPED TO TRACOR MARINE
AND STAGED ONBOARD SEACON

<u>QTY</u>	<u>DESCRIPTION</u>
1	REEL OF 5/16" CONTINUITY WIRE, 1200'
250	2" MUFFLER CLAMPS FOR CONTINUITY WIRE
4	PELICAN HOOKS FOR STOPPING OFF BIGHTS OF CHAIN
2	CHAIN FAIRLEAD BOLLARDS WITH STRONGBACK
1	WINCH BED FOR CHASE WINCH
22	DETACHABLE LINKS COMING FROM: CBC GULFPORT, MISS.
1	150', 5" PLAITED NYLON MOORING LINE WITH HARDEYE AND SHACKLE FROM: OCEAN PRODUCTS RESEARCH, INC. DIGGS, VA.

MATERIAL TO BE SHIPPED TO TRACOR MARINE
AND STAGED ONBOARD SEACON

<u>QTY</u>	<u>DESCRIPTION</u>
1	RUNNING LINE DYNAMOMETER

MATERIAL TO BE PROVIDED BY TRACOR MARINE

<u>QTY</u>	<u>DESCRIPTION</u>
4	3" X 20' PVC MARKER BUOYS WITH ENDS CAPPED (TO BE MANUFACTURED BY TRACOR)
250	WORM DRIVE HOSE CLAMPS (2 1/16"-3" (McMASTER # 5415K22)
24	WIRE ROPE CLIPS (5/16")
3DZ	LEAD PLUGS FOR 2 1/4" DETACH LINKS
1	TOGGLE BAR (2"X3' STEEL BAR WITH CONNECTION POINT)
6	PADEYES FOR STOPPING BIGHTS OF CHAIN
3	WIRE STRAPS FOR STOPPING OFF TO 100K & 50K PADEYES
AST	SHACKLES TO SECURE BEACH-GEAR AND STRAPS TO PADEYES

MATERIAL TO BE PROVIDED BY UCT-ONE

<u>QTY</u>	<u>DESCRIPTION</u>
BOX	WIRE ROPE CLIPS (3/4"- 6 doz, 7/8"-1 doz, 1/2"-2 doz)
1	200' LENGTH OF CONTINUITY WIRE
1	UNDERWATER VOLTMETER
350	SETS OF BOLTS,NUTS&WASHERS FOR TIRES ON RISER FENDERING SYSTEM
1	SET THEODOLITES AND EDM FOR SURVEYING
1	STEEL PLATE FOR RISER PROTECTION SYSTEM
12	1 3/4" SCREW-PIN SHACKLES
12	1" SCREW-PIN SHACKLES
RL	POLYPRO LINE
	TOOLS FOR DETACH WORK(DRIFT PINS, SCREW DRIVERS, ETC)
	ALL DIVE SYSTEMS

INVENTORY OF OCEI EQUIPMENT
STAGED IN NS ROOSEVELT ROADS

<u>QTY</u>	<u>DESCRIPTION</u>	
1	20K DAY WINCH	
4	PEA FLUKES	
4	PEA FAKING BOXES	
1	LARGE PORTABLE MAGAZINE	
1	SMALL PORTABLE MAGAZINE	
2	PEA REACTION VESSELS	
1 SET	4-FOLD BLOCKS (BEACH GEAR)	
1	PEA COLLAR	
50	FLOAT BALLOONS	
1	2-1/4" CARPENTER STOPPER	
1 BOX	MISC PEA GEAR	
4	2-1/4"x 120' HAULDOWN WIRES	
2	PEA BARRELS	
4	BUOYS	
1 PLT	7/8" AND 3/4" WIRE ROPE	
1 RL	NYLON ROPE (SHOCK LINE)	
4	2-1/4" SWIVELS	
2	96" REELS-----	
1	REEL STAND (MORGAN POWERED)] FOR SSRNM
1	5" DIA SHAFT]
1	POWER PACK-----	

INVENTORY OF FLEET MOORING MATERIAL
STAGED AT NS ROOSEVELT ROADS

<u>QTY</u>	<u>DESCRIPTION</u>
4	2" PEAR LINKS
1	12' DIA FOAM BUOY
2	2 1/2" CAMP ANCHOR JOINING LINKS
10	2 1/4" CAMP ANCHOR JOINING LINKS
13	2 1/4" CHAIN SHOTS
16	2 1/4" BALDT DETACHABLE LINKS
1	2 1/4" SWIVEL W/ FROZEN ANCHOR JOINING LINKS
1	2 1/4" GROUND RING
1	16K NAVY STOCKLESS ANCHOR
3	20K NAVY STOCKLESS ANCHORS